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Editor: C. W. Winders, B.Sc.Agr.

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Brucellosis-Tested Swine Herds

(As at 31st May, 1956).

Berkshire.

A. P. and N. Beatty, "Deepdene," Barambah road, Nanango
S. Cochrane, "Stanroy" Stud, Felton
G. Handley, "Handleigh" Stud, Murphy's Creek
J. L. Handley, "Meadow Vale" Stud, Lockyer
O'Brien and Hickey, "Kildurham" Stud, Jandowae East
G. C. Traves, "Wynwood" Stud, Oakey
Westbrook Farm Home for Boys, Westbrook
M. K. Collins, "Kennington" Stud, Underwood road, Eight Mile Plains
H.M. State Farm, "Palen" Stud, Palen Creek
A. R. Ludwig and Sons, "Beau View" Stud, Beaudesert
H. H. Sellars, "Tabooba" Stud, Beaudesert
D. T. Law, "Rossvill" Stud, Trouts road, Aspley
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F. R. J. Cook, Middle Creek, Pomona
Mrs. I. M. James, "Kenmore" Stud, Cambooya
H. L. Stark, "Florida," Kalbar
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N. F. Cooper, Maidenwell
R. H. Coller, Tallegalla, *via* Rosewood
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M. G. and R. H. Atkins, "Diamond Valley" Stud, Mooloolah
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L. Puschmann, "Tayfeld" Stud, Taylor
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G. McLennan, "Murcott" Stud, Willowvale
H. M. Wyatte, "Cumberland Vale," Cooyar
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R. J. Webber, "Webberberry" Stud, 35 Caxton st., Petrie Terrace
J. C. Lees, "Bridge View" Stud, Yandina
F. Thomas, "Rosevale" Stud, M.S. 373, Beaudesert
A. C. Fletcher, "Myola" Stud, Jimbour
Q.A.H.S. and College, Lawes
E. F. Smythe, "Grandmere" Stud, Manyung, Murgon
The Marsden Home for Boys, Kallangur
M. F. Callaghan, Lower Mount Walker, *via* Rosewood
J. B. Lotz, M.S. 794, Kalbar
E. R. Kimber, Coalstoun Lakes
K. B. Jones, "Cefn" Stud, Pilton
A. J. Potter, "Woodlands," Inglewood
Regional Experiment Station, Hermitage
L. Pick, Mulgeldie
J. W. Bukowski, "Secreto" Stud, Oxley

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K. F. Stumer, French's Creek, Boonah
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S. Jensen, Rosevale, *via* Rosewood
Kruger and Sons, "Greyhurst," Goombungee
V. V. Radel, Coalstoun Lakes
H. R. Stanton, Tansey, *via* Goomeri
L. C. and C. P. F. Hill, Kingaroy
L. Stewart, Mulgowie, *via* Laidley.

Tamworth.

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D. F. L. Skerman, "Waverley" Stud, Kaimkillenbun
A. C. Fletcher, "Myola" Stud, Jimbour
Salvation Army Home for Boys, "Canaan" Stud, Riverview
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Department of Agriculture and Stock, Regional Experiment Station, Kairi
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F. N. Hales, Kerry road, Beaudesert
T. A. Stephen, "Withcott," Helidon
W. F. Kajewski, "Glenroy" Stud, Glencoe
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Q.A.H.S. and College, Lawes
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A. J. Potter, "Woodlands," Inglewood
P. V. Campbell, "Lawn Hill," Lamington
L. C. and C. P. F. Hill, Kingaroy

Wessex Saddleback.

W. S. Douglas, "Greylight" Stud, Goombungee
J. Gleeson, "Iona Vale" Stud, Kuraby
C. R. Smith, "Belton Park" Stud, Nara
H. H. Sellars, "Tabooba" Stud, Beaudesert
D. T. Law, "Rossvill" Stud, Trouts road, Aspley
J. B. Dunlop, "Kurrawyn" Stud, Acacia road, Kuraby
F. K. Wright, Narangba, N. C. Line
R. A. Collings, "Rutholme" Stud, Waterford
M. Nielsen, "Cressbrook" Stud, Goomburra
G. J. Cooper, "Cedar Glen" Stud, Yarraman
"Wattledale Stud," 492 Beenleigh road, Sunnybank.
A. J. Hicks, M.S. 98, Darlington, *via* Beaudesert
Kruger and Sons, "Greyhurst," Goombungee
G. C. Burnett, "Rathburnie" Stud, Linville.

British Large Black.

H. W. Naumann, "Parkdale" Stud, Kalbar

Tuberculosis-Free Cattle Herds.

The studs listed below have fulfilled the conditions of the Department's Tuberculosis-free Herd Scheme to 31st May, 1956.

Breed.	Owner's Name and Address.
Aberdeen Angus ..	The Scottish Australian Company Ltd., Texas Station, Texas
A.I.S.	M. E. & E. Scott, "Wattlebrae" A.I.S. Stud, Kingaroy
	F. B. Sullivan, "Fermanagh," Pittsworth
	D. Sullivan, "Bantry" Stud, Rossvale, *via* Pittsworth
	W. Henschell, "Yarranvale," Yarranlea
	Con. O'Sullivan, "Navillus" Stud, Greenmount
	H. V. Littleton, "Wongalea" Stud, Hillview, Crow's Nest
	J. Phillips and Sons, "Sunny View," Benair, *via* Kingaroy
	Sullivan Bros., "Valera" Stud, Pittsworth
	Reushle Bros., "Reubydale" Stud, Ravensbourne
	H. F. Marquardt, "Chelmer" Stud, Wondai
	A. C. and C. R. Marquardt, "Cedar Valley," Wondai
	A. H. Sokoll, "Sunny Crest" Stud, Wondai
	W. and A. G. Scott, "Welena" A.I.S. Stud, Blackbutt
	G. Sperling, "Kooravale" Stud, Kooralgin, *via* Cooyar
	C. J. Schloss, "Shady Glen," Rocky Creek, Yarraman
	W. H. Thompson, "Alfa Vale," Nanango
	S. R. Moore, Sunnyside, West Wooroolin
	H.M. State Farm, Numinbah
	D. G. Neale, "Groveley," Greenmount
	Edwards Bros., "Spring Valley" A.I.S. Stud, Kingaroy
	A. W. Wieland, "Milhaven" A.I.S. Stud, Milford, *via* Boonah
	W. D. Davis, "Wamba" Stud, Chinchilla
	Queensland Agricultural High School and College, Lawes
	C. K. Roche, Freestone, Warwick
	Mrs. K. Henry, Greenmount
	D. B. Green, "Deloraine" Stud, Durong, Proston
	E. Evans, Wootha, Maleny
	T. L. and L. M. J. Cox, "Seafield Farm," Wallumbilla
	J. Crookey, "Arolla A.I.S. Stud" Fairview, Allora
	M. F. Power, "Barfield," Kapaldo
	A. H. Webster, "Millievale," Derrymore
	W. H. Sanderson, "Sunlit Farm," Mulgildie
	R. A. and N. K. Shelton, "Vuegon" A.I.S. Stud, Hivesville, via Murgon
	R. R. Radel & Sons, "Happy Valley," Coalstoun Lakes
Ayrshire	L. Holmes, "Benbecula," Yarranlea
	J. N. Scott, "Auchen Eden," Camp Mountain
	"St. Christopher's" and "Iona" Studs, Brookfield road, Brisbane
	E. Mathie and Son, "Ainslie" Ayrshire Stud, Maleny
	C. E. R. Dudgeon, ""Marionville" Ayrshire Stud, Landsborough
	G. F. H. Zerner, "Pineville," Pie Creek, Box 5, P.O., Gympie
	T. F. Dunn, Alanbank, Gleneagle
Friesian	C. H. Naumann, "Yarrabine" Stud, Yarraman
	D. J. Pender, "Camelot," Lytton road, Lindum
	S. E. G. Macdonald, "Freshfields," Marburg.
Guernsey	C. D. Holmes, "Springview," Yarraman
	A. B. Fletcher, Cossart Vale, Boonah
	W. H. Doss, Degilbo, *via* Biggenden
	A. C. Swendson, Coolabunia, Box 26, Kingaroy
	C. Scott, "Coralgrae," Din Din road, Nanango
	R. J. Wissemann, "Robnea," Headington Hill, Clifton
	G. L. Johnson, "Old Cannindah," Monto
	A. Ruge & Sons, Woowoonga, *via* Biggenden
	G. Miller, Armagh Guernsey Stud, Armagh, M.S. 428 Grantham
Jersey	Queensland Agricultural High School and College, Lawes
	J. S. McCarthy, "Glen Erin" Jersey Stud, Greenmount
	J. F. Lau, "Rosallen" Jersey Stud, Goombungee
	G. Harley, Hopewell, M.S. 189, Kingaroy
	Toowoomba Mental Hospital, Willowburn
	Farm Home for Boys, Westbrook
	F. J. Cox and Sons, "Rosel" Stud, Crawford, Kingaroy Line
	R. J. Browne, Hill 60, Yangan
	P. J. L. Bygrave, "The Craigan Farm," Aspley
	R. J. Crawford, "Inverlaw" Jersey Stud, Inverlaw, Kingaroy
	P. H. F. Gregory, "Carlton," Rosevale, *via* Rosewood
	E. A. Matthews, "Yarradale," Yarraman
	A. L. Semgreen, "Tecoma," Coolabunia
	L. E. Meier, "Ardath" Stud, Boonah
	A. M. and L. J. Noone, "Winbirra" Stud, Mt. Esk Pocket, Esk
	W. S. Conochie and Sons, "Brookland" Stud, Sherwood road, Sherwood
	Estate of J. A. Scott, "Kiaora," Manumbar road, Nanango
	F. W. Verrall, "Coleburn," Walloon
	C. Beckingham, Trouts road, Everton Park
	W. E. O. Meier and Son, "Kingsford" Stud, Alberton, *via* Yatala
	G. H. Ralph, "Ryecombe," Ravensbourne
	Mrs. I. L. M. Borchert, "Willowbank" Jersey Stud, Kingaroy
	W. and C. E. Tudor, "Boree" Jersey Stud, M.S. 498, Gayndah
	Weldon Bros., "Gleneden" Jersey Stud, Upper Yarraman
	D. R. Hutton, "Bellgarth," Cunningham, *via* Warwick
	J. W. Carpenter, Flagstone Creek, Helidon
	H. G. Johnson, "Windsor" Jersey Stud, Beaudesert
	W. S. Kirby, Tinana, Maryborough
	S. A. Crarb, "Trecarne Stud," Lockyer
	G. & V. Beattie, "Beauvern," Antigua, Maryborough
	J. A. & E. E. Smith, "Heatherlea" Jersey Stud, Chinchilla
	W. O M. Birt, "Pine Hill" Jersey Stud, Gundiah
	T. Nock, Dallarnil
	P. Fowler & Sons, "Northlea," Coalstoun Lakes
	F. Porter, Conondale
Poll Hereford ..	W. Maller, "Boreview," Pickanjinnie
	J. H. Anderson, "Inverary," Yandilla
	D. R. and M. E. Hutton, "Bellgarth," Cunningham, *via* Warwick
	E. W. G. McCamley, Eulogie Park, Dululu
	Wilson and McDouall, Calliope Station, Calliope

Banana Fruit Filling

By F. W. BERRILL, Horticulturist.

Poor filling of the fruit is encountered by most banana growers at some time or other and can result in appreciable financial loss when it occurs. The labour, expense and effort required for the production of good bunches are largely wasted if the fruit is only partially filled, angular and of little market value.

Mechanism of Fruit Filling.

Throughout the life of the banana plant, complex substances such as starches, sugars and proteins are manufactured in the leaves and pseudostem from raw materials obtained through the roots and from the air. Some of these are used directly in the growth processes of the plant and its developing suckers, and the balance is stored in the corm. The more efficient the root system and the larger the effective leaf area of the plant, the greater is the amount of stored plant food in relation to that actually used in maintaining the plant.

Once the plant passes from the vegetative to the reproductive phase, leaf production ceases. The food reserve in the corm then becomes available to meet the requirements of the bunch and the following sucker, the former usually having priority. It follows, therefore, that plant growth (Plate 1) before the bunch is thrown

Plate 1.

Cavendish Banana. Bunch well filled and ready to cut. The follower was set shortly before the bunch was thrown and all surplus sucker growth has been suppressed.

has a considerable influence on the filling of the fruit, even though the bunch itself does not appear until after that phase is completed.

Under southern Queensland conditions, the parent plant has usually lost approximately two-thirds of its total number of leaves by the time the bunch is thrown. The remaining leaves still function while they are alive, but the amount of plant food which they are able to supply to the bunch is small compared with the reserve which should have already accumulated in the corm.

Once the bunch is thrown, the rate of withdrawal of the reserves in the corm is normally fairly high, but the period during which it is maintained depends to some extent on the weather at the time.

Thus, when the bunch develops under favourable conditions, food reserves are drawn from the corm until the bunch is approximately half mature. From this stage onwards, the main requirement for the production of well-filled fruit is adequate moisture for the plant.

In the case of bunches thrown during the winter, however, or even where an autumn bunch encounters cool conditions during its development, the period of dependence on the parent corm may be somewhat longer.

Cause of Poor Filling.

Faulty fruit filling in bananas may be the result of one or a combination of several factors. Fundamentally, the reserve of stored foods in the corm of the parent plant together with the amount contributed by the remaining green leaves determines the size to which the fingers may develop. The magnitude of the reserve and/or the extent to which it can be drawn upon by the developing bunch will decide the final degree of filling in the fruit assuming that moisture is not a limiting factor.

The causes of poor filling may thus be divided into two categories:—(*a*) those which tend to prevent the accumulation of food reserves in the corm; and (*b*) those which affect the movement of the reserves to the bunch.

Availability of Plant Foods.

A plant which is not well supplied with the major nutrients (nitrogen, phosphorus and potassium) during its growing period will be lacking in vigour and cannot be expected to build up a food reserve as great as one which has access to an adequate supply of these materials in the soil. A deficiency usually exists unless adequate amounts of fertilizer are used in the plantation, except perhaps in the more fertile scrub soils.

Other common causes of depleted vigour are low soil moisture, reduced sunlight as a result of excessively close planting, and shading from adjacent standing timber.

If the root system is impaired by nematodes, root rots or weevil borer, the plant is unable to absorb inorganic salts from the soil efficiently, irrespective of whether they are present in quantity or not, and this virtually amounts to malnutrition (Plate 2).

Another factor which is of considerable importance in northern districts, and in some seasons in the southern areas as well, is the reduction of the functional leaf area as a result of leaf spot infection.

The deleterious effect on the bunch of suckers drawing on the corm reserves is not quite so apparent as that due to pests and diseases, but wherever a bunch matures on a plant which carries no follower, the improvement in fruit filling is usually very marked. It follows, therefore, that while selected followers must be preserved for the next crop, the early destruction of surplus suckers is important in commercial practice.

Plate 2.

Fruit of the Mons Mari Banana. Left is full fruit with rounded fingers. Right is angular fruit from a plant which lacks vigour.

Temperature and Soil Moisture.

Temperature and soil moisture probably control the transfer of food materials from the corm to the bunch more than anything else, for they determine the rate of plant growth and the rate of sap movement.

It is normal for the fingers to decrease in length and degree of filling from the upper to the lower end of the bunch, but this tendency towards reduced filling in the terminal hands increases progressively as the growth rate of the plant is reduced. In the case of bunches developing during the winter months, particularly in the Cavendish variety, the bunch taper may be quite appreciable.

For the same reason the overall degree of filling is usually much lower in winter than in summer bunches. Likewise the difference between fruit produced on southerly as opposed to warmer northerly aspects is generally quite apparent.

Apart from the end-to-end taper of the bunch there is usually a variation in filling as between the "front" or exposed hands and those adjacent to the parent pseudostem, the latter being more angular. This effect is usually more pronounced in plantations on southerly slopes and on bunches exposed to cold westerly winds.

It is not possible to differentiate between the effects of inadequate soil moisture and low temperature on the movement of food materials within the plant, since they are closely related. As a general rule, however, moisture is of primary importance during spring and early summer, whereas both operate together during the winter, at least under southern Queensland conditions.

Practical Considerations.

There is much that a grower can do to remedy poor filling of the fruit.

Basically, the solution to the problem lies in the use of good-sized, healthy, vigorous planting material and the subsequent management of the plantation so as to ensure the development of plants with an efficient root system and a large healthy crown of leaves.

This necessarily means that the plants are adequately fertilized, shading and weed competition are eliminated, soil moisture is maintained, pests and diseases are controlled—in fact, every effort is directed towards promoting and maintaining the maximum vigour in the plants throughout their vegetative life.

The control of the movement of food materials within the plant is to some extent beyond the power of the grower. However, much can be done to minimise imperfect filling by locating plantations in warm, sheltered situations.

In addition, the use of hessian bunch covers will improve the filling of the fingers appreciably, and at the same time produce more even bunches with a minimum of taper from end to end and from front to back. Even on northerly aspects in southern Queensland, the use of covers on bunches developing during late autumn and winter is well worthwhile.

Irrigation facilities are also of considerable value because a supplementary supply of water to the plant and the developing bunch during dry periods maintains the movement of food reserves from the corm to the fruit.

TOBACCO RESEARCH.

The Minister for Agriculture and Stock (Hon. H. H. Collins, M.L.A.) has announced that the Queensland Government has approved that the Department of Agriculture and Stock participate in a Commonwealth-wide scheme for tobacco research.

The scheme, which was drawn up in consultation with the Australian Agricultural Council, provides for a capital contribution of £168,000 to be spent on the provision of research facilities, half of this sum being contributed by the Commonwealth Government and half by the tobacco manufacturers. In addition, an annual maintenance fund of £63,000 will be met by contributions from growers (£14,000), manufacturers (£28,000) and the Commonwealth Government (£21,000).

Of this money Queensland will receive £30,650 as capital and £22,600 as annual maintenance.

Mr. Collins said that this money, added to the very considerable capital outlay and maintenance costs already expended by his Department, will provide first-rate services for the Queensland tobacco industry.

Part of the capital will be used in equipping new experiment stations at Parada (near Mareeba) and Inglewood. Additional officers will be trained and one will be sent to America to study quality of leaf.

The Beauty of Glen Retreat Mandarin

By A. J. CROCKER, Adviser in Horticulture.

The origin of the Beauty of Glen Retreat mandarin is not quite clear but the parent tree of the many thousands now grown in commercial orchards throughout Queensland was owned by Mr. W. H. Parker, of Enoggera, a suburb of Brisbane. The variety takes its name from Mr. Parker's property—Glen Retreat.

The original tree was an outstanding type, vigorous with a heavy production record. It was pulled out about 1907.

Characteristics of the Variety.

The Beauty of Glen Retreat mandarin is commonly known as the "Glen". The leaves are relatively small, but in a vigorous tree the canopy is dense and somewhat spreading.

As the crop matures between May and June, the variety can be classed as an early or mid-season type. On well-grown trees, the fruit is about three inches in diameter, but when the tree is overloaded, as frequently happens, fruit size becomes rather small. In well-managed irrigated orchards, the yields from good-type mature trees average nine bushel cases, but some of the best trees produce up to 18 bushels of fruit of excellent quality.

The fruit is firm and solid with very little waste. The skin is smooth, thin, reddish-orange in colour when fully

Plate 1.

The Burnett River. The Beauty of Glen Retreat is one of the most important citrus fruits grown in irrigated orchards along the banks of the river.

ripe and, although there is practically no rag, easily removed from the flesh. When properly handled in the orchard and packed after being sweated in the shed for a few days, the fruit carries well, even to distant markets.

Rootstocks.

The Glen Retreat mandarin is grown on a number of rootstocks, including the citronelle (or rough lemon), sweet orange and Emperor mandarin. In the Gayndah district (Plate 1) there are numerous good blocks of trees on each of these stocks.

During recent years, however, growers have had considerable difficulty in establishing Glen Retreat trees budded onto citronelle stock and the current demand is, therefore, for trees on sweet orange or Emperor mandarin stocks. The early growth of trees on both of these stocks is much slower than that of trees on citronelle but the vigour of the mature trees is better.

Establishing the Young Tree.

The establishment of a block of Glen Retreat mandarins is sometimes difficult, and in a number of orchards young trees have been removed at an early age because of their unthrifty appearance. The main symptoms of this premature decline are yellowing of the leaves and partial leaf fall, followed by the death of the twigs and some of the branches.

Nevertheless, the fact remains that many Glen Retreat mandarin trees in commercial orchards are 20 years or more old. One outstanding block of 200 trees in the Gayndah district was planted in 1916 and is still producing 14 bushel cases of excellent fruit per tree each year; these particular trees are on Emperor stock.

It is interesting to note that several good blocks of Glen Retreat mandarin trees at Gayndah were difficult to establish in the first place and it may be accepted as a fact that the young trees require more attention than most other varieties of citrus.

The young Glen Retreat mandarin must not be neglected during the first few years of its life. Growers have a tendency to let young citrus trees fend for themselves until they come into bearing. This is due partly to pressure of work in an established orchard and partly to the mistaken belief that young trees can "make their own way" for three to four years after planting. The Glen Retreat mandarin will not tolerate such treatment, particularly when established on replant land.

Regular watering is necessary in dry weather, fertilizer must be applied at least once a year and weed growth must be suppressed around the trunk. Under no circumstances should deep-cutting implements be used close to the trunk; the risk of bark injury at the stock-scion union and to the roots is far too great.

The young trees require shaping during the first two or three years after planting. Scaffold limbs should not exceed four and these must be spaced so as to prevent overcrowding in later years. If the trees are left unpruned, they tend to develop long weak limbs which are susceptible to wind injury, especially when they carry a crop of fruit.

The Glen Retreat mandarin commences to bear at an early age. If the fruit is allowed to remain on the young tree, subsequent growth may be seriously affected. It is axiomatic, therefore that, in this variety at least, all fruit must be removed from the tree until it has entered its fourth year. A light crop may then be retained. Removal of the fruit takes place in December or January.

The Mature Tree.

The mature Glen Retreat mandarin is a densely foliaged tree (Plate 2) with a pronounced tendency to overbear. Efficient pruning and regular

hand thinning of the crop are therefore necessary each year to maintain annual production at about nine bushels per tree.

Pruning has a double purpose—to open up the tree and to reduce the amount of fruit-bearing wood for the following crop. Treatment therefore varies from tree to tree according to the vigour of the tree and the size of the previous crop. Healthy trees which have borne an average or better-than-average crop should be pruned lightly. In trees which have carried a light crop, heavier pruning is desirable. In both cases, weak wood should be thinned out.

Hand-thinning of the fruit is essential in the Glen Retreat mandarin. If the whole of the crop is allowed to mature on the tree, much of the fruit will be undersized, and at the end of the season the tree will be lacking in vigour. The grower must therefore assess the amount of commercial fruit which the tree can reasonably be expected to mature and then thin accordingly. In some years, it may be necessary to remove up to two-thirds of the fruit in the December-January period.

In most blocks of Glen Retreat mandarins, odd trees become obviously unthrifty owing to over-bearing, nutritional disorders, or the misuse of oil sprays. The last of these is particularly noteworthy, for the variety cannot tolerate oil schedules which are standard for other varieties of citrus.

Plate 2.

Beauty of Glen Retreat Mandarin Tree, 7 Years Old, After the Winter Pruning.

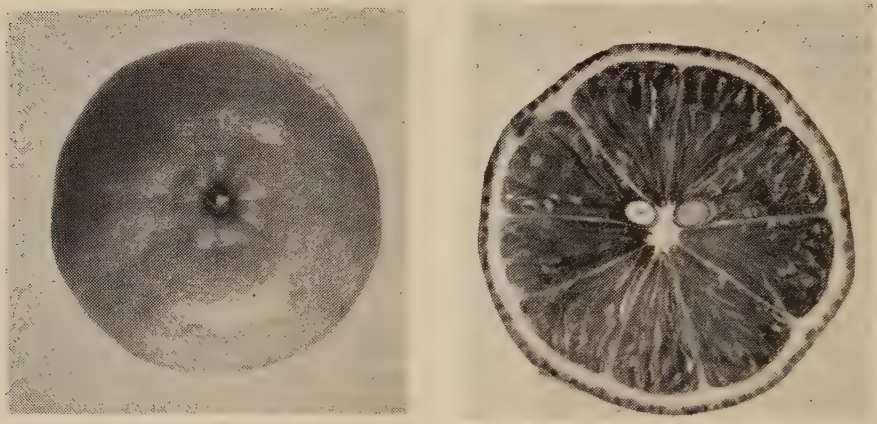

Plate 3.

Fruit of the Beauty of Glen Retreat Mandarin. Whole fruit and cross section. Note the fine-textured thin skin.

Unthrifty trees should be pruned lightly in winter, and in the following December most of the fruit should be removed by hand. The enforced rest will usually bring the tree back into normal vigour and productivity.

Status of the Variety.

The Glen Retreat mandarin fills a unique place in the citrus industry in Queensland. The fruit is unsurpassed in quality when grown in sub-coastal areas under irrigation and commands a premium in all markets. In spite of the difficulties experienced in bringing the tree to maturity and handling it when mature, the area under crop continues to expand.

As the tree needs special attention, few growers now plant large areas. The current trend is to restrict new plantings to blocks of one or two acres with the aim of servicing the trees well enough to keep them healthy and productive.

TRACTOR FUELS.

Results of a survey of tractors on Australian farms in 1954 have recently been made available by the Bureau of Census and Statistics.

They show, among other things, that kerosene fuel was used in 70 per cent. of wheeled tractors and 39 per cent. of crawler tractors. Diesel fuel was the most popular for crawlers, 53 per cent. of this type being run on diesel oil.

Kerosene was the fuel used by the majority of wheeled tractors in the horsepower groups from 10 to 40. Of the higher-powered machines, 55 per cent. were diesels, and 70 per cent. of the lowest-powered group used petrol.

The survey revealed that in 1954 there were 155,000 wheeled tractors and 15,000 crawler tractors in the mainland States.

Bean Rust Control

By B. L. OXENHAM, Pathologist.

A new race of bean rust appeared in Queensland in 1948 to which the popular French bean varieties were highly susceptible. Since that year rust has become widespread in most of the French bean growing districts and is now considered the most serious bean disease in the State.

The fungus responsible for bean rust (*Uromyces appendiculatus* (Pers.) Unger) mainly attacks the leaves, although pustules are also found on the stems and sometimes the pods. Both sides of the leaves become covered with small yellow spots, which quickly develop brown pustules about the size of pin-heads. Badly affected leaves become yellow and eventually die. If appreciable leaf damage occurs the development of the pods is affected.

Plate 1.

Leaf of French Bean, Showing Rust Pustules on the Under Surface.

Methods of Spread.

Each rust pustule contains thousands of spores which may be spread considerable distances by wind. Rust is not seed-borne but the spores may carry over from one season to the next on crop refuse. In coastal Queensland some beans are growing at all times, so sources of the disease are always present.

Rust is favoured by high humidity but it can continue to spread in relatively dry weather if spray irrigation is used or heavy dews occur. Close planting, bad drainage and unsuitable aspect increase the risk of rust and any factors retarding plant growth intensify the effects.

Rust is most serious in southern Queensland during late winter and early spring, when plant growth is slow and numerous old infected crops are present from which the spores may spread.

Control.

All the commercial varieties of French beans at present grown in Queensland are susceptible to rust. A breeding programme has been in operation for some years in an endeavour to produce resistant types suitable for commercial bean growing. This work has shown considerable promise but it may be some time before seed of resistant varieties is available in large quantities.

Recent experiments have shown that sulphur dust and zineb provide good control of rust when applied at an early stage and continued at weekly intervals. The costs per acre of materials for the two treatments are similar.

In the course of the experiments the following facts were illustrated:—

(1) Copper sprays and dusts injure bean plants when applied regularly.

(2) Rust does not appreciably reduce yields unless it becomes well established in the crop before flowering.

(3) Sulphur dust controls angular leaf spot (*Isariopsis griseola* Sacc.) as well as rust.

(4) There is more danger of damaging the flowers and very young pods if sulphur is applied during warm weather.

Summary of Control Measures.

(1) Everything possible should be done to maintain vigour in the crop.

(2) Unsuitable aspects or shady sites should not be planted to beans in the cold months of the year.

(3) Rust-infected bean crops should be promptly destroyed, once picking is finished, by ploughing or other means.

(4) When rust has become established in young crops and may be expected to reduce yields in subsequent plantings, a 100% sulphur dust or zineb spray (2 lb. of a zineb product containing 65 per cent. active ingredient to 100 gallons of water), should be applied, commencing at the 2-4 leaf stage and continuing at weekly intervals until the pods are developing. A thorough cover of both sides of the leaves is essential. Dusting with sulphur should not be attempted during flowering if the weather is very warm.

New Fordson Major Diesel Tractor Officially Tested

The Australian Tractor Testing Committee has recently issued technical reports on tests conducted on the New Fordson Major Diesel and Kerosene Model tractors. Special editions for farmers have been prepared; that for the Diesel Model is reprinted here and that for the kerosene model will appear in the July issue. Copies of the reports on both models may be obtained from the Department of Agriculture and Stock, William Street, Brisbane.

1. INTRODUCTION.

After 12 hours of running-in, two types of tests were carried out, in order to measure the performance of the engine, as measured by the power in the belt driven by the belt pulley, and the performance of the tractor as a whole, as measured by drawbar pull, tractor speed, wheel slip, and drawbar horsepower (d.b.h.p.), with the tractor running on a bitumen test track.

For maximum loads the throttle was full open; for part loads the governor control was set to give rated speed at the desired loads. The fuel used was distillate (Cetane No. 58).

Terms Used.

It is necessary to explain certain terms used in the tables in which the results are reported. Reference to these explanations is made in the tables by letters in brackets.

(*a*) Corrected maximum horsepower is the actual observed maximum horsepower corrected to what it would be at 60 deg. F. and at sea level.

(*b*) Engines are not expected to run indefinitely at full or maximum power output, but they can be expected to run continuously at 85 per cent. of the corrected maximum b.h.p. and 75 per cent. of the corrected maximum d.b.h.p. These are known as the rated b.h.p. and rated d.b.h.p.

(*c*) Fuel consumption in gallons per hour has no meaning unless we also quote the corresponding h.p. output.

(*d*) This is the "specific fuel consumption"—the weight of fuel consumed per unit of energy developed by the engine. When this figure is least the engine is giving its best economy or efficiency.

(*e*) Average loading under governor represents the average performance one might expect from the engine while driving a variety of belt loads, from light to heavy.

(*f*) Wheel slip can be measured by noting that, in travelling a certain distance, the back wheels make more turns when working under load than when running with no load on the drawbar. The difference in these revolution counts divided by the former count gives the slip as a ratio, which may be written as a percentage.

(*g*) The pulls given in Table 4 are not the maximum pulls available in the gears (that is, not the maximum sustained pulls), but the pulls at maximum drawbar power (that is, at full throttle at rated engine speed).

2. BELT TESTS.

The belt tests show the power (belt horsepower, b.h.p.) that the tractor may be expected to deliver when driving a machine by the belt.

Belt test results are shown in Table 1.

TABLE 1.

RESULTS OF BELT TESTS.

	B.H.P.	Engine Speed.	Fuel.	
			Gall./ hr. (*c*).	lb./ b.h.p. hr. (*d*).
1. Rated Engine Speed, 1,600 r.p.m.				
2. Fast Idling Speed about 1,730 r.p.m.				
3. Observed maximum b.h.p. at rated speed	38·7	1,601	2·21	0·48
4. Corrected maximum b.h.p. rated speed (*a*)	39·4	Observed maximum value corrected for atmospheric temperature and pressure at time of test.		
5. Calculated rated load (*b*1) ..	33·5			
6. Test at approximately rated load	33·3	1,600	1·83	0·46
7. Average loading under governor (*e*)	20	1,630	1·3	0·54
8. Equivalent engine torque at full throttle	127 ft. lb. at maximum power and rated speed.			
	136 ft. lb. (maximum) at 1,100 r.p.m.			

Governor set to run this test at approximately rated speed.

3. DRAWBAR TESTS.

Tables 2-4 show the drawbar performance of the tractor, on the bitumen test track, wearing rear tyres 14 x 28, carrying standard weight (1,990 lb. front, 5,630 lb. rear; total 7,620 lb.), working in the gears named in the tables. Height of drawbar, 14 inches.

TABLE 2.

DRAWBAR PERFORMANCE—MAXIMUM POWER AT RATED (3RD) GEAR.

1. Rated Engine Speed, 1,600 r.p.m.	D.B.H.P. (*f*).	Pull lb.	Speed m.p.h.	Wheel Slip % (*g*).
2. Observed maximum d.b.h.p. at rated engine speed	36·4	4,000	3·41	8
3. Corrected maximum d.b.h.p. at rated engine speed (*a*)	36·4	Observed maximum value above corrected for atmospheric conditions at time of test.		
4. Calculated rated load (*b*2) ..	27·3			

TABLE 3.

DRAWBAR PERFORMANCE AT RATED ENGINE SPEED—PULL AT MAXIMUM DRAWBAR HORSEPOWER.

Gear.	D.B.H.P.	Pull lb. (*h*)	Speed m.p.h.	Wheel Slip %.
1	26	5,570	1·8	20
2	34	4,780	2·6	12
3	36	4,000	3·4	8
4	36	2,660	5·1	4
5	34	1,780	7·2	2
6	29	820	13·3	0½

TABLE 4.

DRAWBAR PERFORMANCE WITH VARIOUS LOADS AT RATED (3RD) GEAR.

Pull. lb.	Speed. m.p.h.	D.B.H.P.	Per Cent. of Maximum d.p.h.p.	Slip. %	Fuel.	
					Gall./hr.	lb./d.b.h.p. hr.
1,510 ..	3·70	15	41	2	1·1	0·63
2,060 ..	3·58	20	54	3	1·3	0·54
2,600 ..	3·55	25	67	4	1·5	0·52
3,160 ..	3·69	31	85	5	2·0	0·54

Governor set to run these tests at approximately rated engine speed.

Drawbar tests are carried out on a hard prepared surface. Most field conditions present higher resistance to the tractor's motion, so that, in the field, the maximum drawbar pulls available in any gear will usually be less than those shown in the tables.

Wheel slips may also be greater in the field. To that extent, tractor speeds in miles per hour in the field will be less than those shown in the tables.

Because of the factors mentioned, the drawbar horsepowers available in any gear in the field will usually be less than those shown in the tables.

4. SUMMARY OF POWER OUTPUT.

Table 5 gives a summary of the power output at the belt and at the drawbar.

TABLE 5.

SUMMARY OF POWER OUTPUT.

—	At the Belt.	At the Drawbar.
Rated engine speed, r.p.m.	1,600	1,600
Corrected maximum power (*a*)	39·4	36·4
Rated power (*b*)	33·5 (*b*1)	27·3 (*b*2)

5. OTHER OBSERVATIONS.

Duration of Test.—84 hours, including running-in.

Radiator Water Used.—None.

Lubricating Oil.—S.A.E. 20; weight to engine, 15·3 lb.; weight from engine after tests, 14·2 lb.

Inspection After Test.—Engine and transmission in satisfactory condition.

Steering.—Easy to steer with the steering wheel while under load. Turning circle without brakes, 27 ft. left, 27½ ft. right; with brakes, 24 ft. left, 23½ ft. right.

PERSONAL ITEMS.

Following the State elections in May, Hon. H. H. Collins, M.L.A. was again selected as Minister for Agriculture and Stock. Mr. Collins has been in charge of the Department of Agriculture and Stock since March, 1946, and has only a few months to serve to exceed the record term of 10½ years served by Hon. F. W. Bulcock.

Mr. Arthur F. Bell, Under Secretary of the Department of Agriculture and Stock, was recently awarded the Farrar Memorial Medal. This medal is awarded each year to perpetuate the memory of William Farrar and to reward one for distinguished service to agricultural science.

CROP PLANTING TABLES

Showing Times of Planting and Rates of Sowing for Field Crops.

BY OFFICERS OF THE AGRICULTURE BRANCH.

(*Continued from page 203 of the April issue.*)

Planting tables for the Central District are given in this issue, and hereunder is a map showing the main rainfall lines for the whole of the State.

Map Showing Main Rainfall Lines.

CENTRAL DISTRICTS.

SOWING AND PLANTING TABLE FOR FIELD CROPS.

(This Table requires to be adapted to suit individual circumstances.)

Crop.	Main Purpose for Which Grown.	When to Sow or Plant.		How Sown or Planted.				Approximate Period of Growth of Crop in Months.	Remarks.
		Coastal Districts.	Tableland and Inland Districts.	Distance Rows Apart.	Distance Between Plants.	Quantity of Seed per Acre if Drilled.	Quantity of Seed per Acre if Broadcast.		
				Ft. in.	Ft. in.				
Arrowroot	Flour and pig food	Aug. to Nov.	Sep. to Oct.	5 0	2 0	10 to 12 cwt. of bulbs	..	8 to 10	Suited best to coastal districts
Artichoke	Pig food	Aug. to Nov.	Sep. to Nov.	3 6	1 6	4 to 5 cwt. of tubers	..	4 to 5	Difficult to store; will keep better in soil
Barley (Cape and Skinless)	Grazing and green feed	Mar. to June	Mar. to June	Drilled	..	1 bus.	1½ bus.	2 to 4	..
Beans, Lima	Seed	July to Jan.	Sep. to Dec.	2 6	0 9	20 to 25 lb.	..	3 to 4	..
Beans, Navy or Canning	Seed	Sep. to Jan.	Sep. to Jan.	2 4	0 4	15 to 24 lb.	..	3 to 3½	Wider rows for fertile soils
Beet, Silver	Green feed for poultry	Mar. to June	Mar. to June	2 6	1 0	4 lb.	..	3 to 4	..
Broom Millet	Brushware	Sep. to Dec.	Sep. to Dec.	3 6	0 9	3 to 4 lb.	..	4½ to 5	..
Buckwheat	Nectar for bees; grain for poultry	Aug. to Mar.	Aug. to Mar.	2 0	0 3	25 to 30 lb.	40 to 45 lb.	1½ to 2½	Produces a valuable nectar crop within 6 weeks of planting
Canary Seed	Hay, green feed and grain	Mar. to June	Mar. to June	Drilled	..	10 to 15 lb.	20 to 25 lb.	4½ to 5	Not recommended for grain in this zone
Carrot, Field	Stock food	Mar. to June	Apr. to May	1 9	..	2 to 3 lb.	..	4 to 5	..
Cassava	Pig food	Aug. to Oct.	Sep. to Oct.	5 0	2 0	Cuttings used	..	8 to 10	Boil tubers before using; discard water
Cotton	Fibre	Sep. to Nov.	Sep. to Nov.	3 6	1 0	15 to 20 lb. de-linted seed	..	5 to 7	..
Cowcane	Green feed	July to Dec.	Sep. to Dec.	5 0	2 0	2 or 3-eyed setts used	..	7 to 9	Suitable for several ratoons
Cowpeas*	Seed, grazing and hay	Sep. to Jan.	Oct. to Jan.	3 0	0 6	6 to 10 lb.	15 to 20 lb.	3½ to 4½	For green manure purposes, *see* under "Leguminous cover crops"

Garlic	Market	Mar. to May	Mar. to May	1 6	0 6	..	..	6	..
Grasses (*see* Pastures)									
Leguminous Cover Crops*—									
Blue Lupin	Green manure	Autumn	Autumn	Drilled	..	1 bus.	1½ bus.	5	Erect growth
Cowpeas	Green manure	Summer	Summer	Drilled	..	20 to 25 lb.	25 to 30 lb.	3½ to 4	Creeping growth
Cusara Pea	Green manure	Summer	Summer	Drilled	..	5 lb.	10 lb.	5 to 6	Erect growth
Field Pea	Green manure	Autumn	Autumn	Drilled	..	1 to 1½ bus.	1½ to 2 bus.	3 to 4	Creeping growth
Gambia Pea	Green manure	Summer	Summer	Drilled	..	5 lb.	10 lb.	5 to 6	Erect growth
Mauritius (Velvet) Bean	Green manure	Summer	Summer	3 0	2 0	20 lb.	40 to 60 lb.	5	Creeping growth
Poona Pea	Green manure	Summer	Summer	Drilled	..	20 to 25 lb.	20 to 30 lb	3½ to 4	Semi-erect growth
Rice Bean	Green manure	Summer	Summer	Drilled	..	15 to 20 lb.	20 to 25 lb.	4 to 5	Creeping growth
Soybean	Green manure	Summer	Summer	Drilled	..	20 to 30lb.	25 to 35 lb.	3½ to 4	Semi-erect growth
Tangier Pea	Green manure	Autumn	Autumn	Drilled	..	10 lb.	12 lb.	5	Creeping growth
Vetches or Tares	Green manure	Autumn	Autumn	Drilled	..	¾ to 1 bus.	1 to 1½ bus.	3½ to 4½	Creeping growth
Linseed (Flax)	Seed for oil	Apr. to June	Apr. to June	Drilled	..	20 to 25 lb.	..	4½ to 5	..
Lucerne*	Hay and grazing	Apr. to May	Apr. to May	Drilled	..	10 to 12 lb.	14 to 18 lb.	3	For grazing in drier areas, 4 to 6 lb.; in grass mixtures, 1 to 3 lb.
Maize	Grain and green feed	Aug. to Dec.	Sep. to Dec.	4 0	1 3	8 to 10 lb.	56 lb. for stock food	4 to 5; for stock food 3 to 4	For green feed closer row and plant spacing with increased seed rate
Pop Corn	Grain	Sep. to Jan.	Oct. to Jan.	3 6	1 0	5 to 7 lb.	..	4	..
Sweet Corn	Market	Sep. to Jan.	Oct. to Jan.	3 6	1 0	6 to 8 lb.	..	3	..
Mangel and Sugar Beet	Stock food	Feb. to May	Mar. to May	2 6	1 0	4 to 6 lb.	..	6 to 7	..
Millet (French)	Seed	Sep. to Jan.	Oct. to Jan.	Drilled	..	10 to 14 lb.	20 lb.	2 to 2½	..
Millet (Giant and Dwarf Setaria)	Seed, hay and grazing	Aug. to Feb.	Sep. to Feb.	Drilled	..	10 to 14 lb.	20 lb.	2½ to 3	Can be grazed earlier if required
Millet (Japanese)	Hay, green feed and grazing	Aug. to Feb.	Sep. to Feb.	Drilled	..	10 to 14 lb.	20 lb.	2 to 3	Can be grazed earlier if required

*The use of bacterial inoculum with most leguminous plants is recommended. Supplies are obtainable free from the Department of Agriculture and Stock, Brisbane, Gympie or Warwick.

CENTRAL DISTRICTS—*continued.*

SOWING AND PLANTING TABLE FOR FIELD CROPS.

(This Table requires to be adapted to suit individual circumstances.)

Crop.	Main Purpose for Which Grown.	When to Sow or Plant.		How Sown or Planted.				Approximate Period of Growth of Crop in Months.	Remarks.
		Coastal Districts.	Tableland and Inland Districts.	Distance Rows Apart.	Distance Between Plants.	Quantity of Seed per Acre if Drilled.	Quantity of Seed per Acre if Broadcast.		
				Ft. in.	Ft. in.				
Millet (White Panicum)	Hay, green feed and grazing	Aug. to Feb.	Sep. to Feb...	Drilled	..	10 to 14 lb.	20 lb.	2½ to 3	Can be grazed earlier, if required
Oats	Grazing, green feed, hay and grain	Mar. to June	Mar. to June	Drilled	..	1½ bus.	1½ to 2 bus.	3 to 5	..
Onion	Market	Apr. to May..	Apr. to May..	1 2	3 to 6 in.	1½ to 3 lb.	..	5 to 6	..
Panicums (*see* Millets)									
Pasture Grasses—									
Blue Panic	Pasture	Sep. to Mar...	Sep. to Feb..	..	..	..	4 lb.	Perennial; summer grower	Graze heavily and intermittently once established
Buffel	Pasture	Sep. to Mar...	Sep. to Mar...	..	..	..	4 to 5 lb.	Perennial; summer grower	Sandy or deep soils best; lighter sowing rate in the west on sandy country
Elephant	Pasture and green feed	Sep. to Feb...	Oct. to Jan...	5 0	2 6	Root and stem cuttings used	..	Perennial; summer grower	Graze or cut frequently to prevent woody stemsdeveloping; ratoons vigorously
Green Panic	Pasture	Sep. to Mar...	Oct. to Feb...	7 to 28 in.	..	2 to 4 lb.	4 to 5 lb.	Perennial; summer grower	Planting rate will vary according to row width and seed germination
Guinea	Pasture	Sep. to Mar...	Oct. to Feb...	2 0	2 0	Root cuttings may be used	4 to 5 lb.	Perennial; summer grower	Graze to maintain young growth, but allow resting period
Kikuyu	Pasture	Sep. to Feb...	Oct. to Feb...	3 0	3 0	Runner cuttings used; or plough or disc in chopped runners	..	Perennial; summer grower	Only Tableland areas in northern part of Central district
Mitchell	Pasture	..	Spring and early summer	..	..	..	2 to 3 lb.	Perennial; summer grower	Trample in seed with sheep

Molasses	Pasture	Sep. to Mar...	Oct. to Feb...	..	..	..	2 to 4 lb. ..	Perennial; summer grower	Used on scrub burns; needs careful grazing; suitable only in limited areas; frost susceptible
Para	Pasture	Sep to Feb. ..	..	6 0	6 0	Runner cuttings used; or plough or disc in chopped runners	3 to 4 lb. ..	Perennial; summer grower	Used in swamps or where water supply ample or ground always damp
Paspalum	Pasture	Sep. to Mar.	..	..	..	..	8 to 12 lb. ..	Perennial; summer grower	Best growth where rainfall exceeds 40"
Prairie	Pasture	Mar. to May	Mar. to May	..	..	..	20 to 25 lb. ..	Annual; winter and spring grower	May regenerate if allowed to seed
Rhodes	Pasture	Sep. to Mar...	Oct. to Mar...	7 to 21 in.	..	2 to 4 lb. ..	8 to 12 lb. ..	Perennial; summer grower	Planting rate will vary according to row spacing and seed germination
Pasture Legumes*—									
Black Medic ..	Pasture mixtures ..	Autumn ..	Autumn ..	..	..	..	2 to 3 lb. in mixtures	Annual or biennial	Growth extends into summer; may regenerate
Lucerne	Pasture mixtures ..	Feb. to May.	Feb. to May..	..	..	½ to 3 lb. ..	1 to 3 lb. ..	Perennial ..	Can be used with either summer or winter pasture mixtures
Phasey Bean ..	Pasture mixtures ..	Spring and summer	Spring and summer	..	..	½ to 1 lb. ..	1 to 2 lb. in mixtures	Annual; summer grower	Regenerates; may be useful in Rhodes grass country
Stylo	Pasture mixtures ..	Spring ..	..	..	..	..	5 lb. in mixtures	Perennial; summer grower	..
Townsville Lucerne	Pasture mixtures ..	Spring ..	..	..	..	..	5 to 6 lb. in mixtures	Annual; summer grower	Regenerates
White Clover ..	Pasture mixtures ..	Early autumn	Early autumn	..	..	..	2 lb. in mixtures	Perennial; winter and spring grower	Best suited to high Tableland areas, *e.g.*, Eungella
Pea, Field*	Green feed and grazing	Mar. to June	Apr. to June	Drilled	..	1 to 1½ bus. ..	1½ to 2 bus. ..	3 to 4 ..	When sown in combination with a cereal, ½ to ¾ bus. per acre; for green manure purposes, *see* under "Leguminous cover crops"
Peanut	Kernels	Sep. to Dec...	Sep. to Dec...	3 0	1 3	25 to 30 lb. of kernels	..	4 to 5 ..	..
Potato	Market	June and Jan.	June and Jan.	2 6	1 0	6 to 8 cwt. of tubers	..	3 to 4 ..	..
Pumpkin	Market and stock food	Sep. to Jan...	Sep. to Jan...	8 to 12 feet	3 to 4 feet	2 to 3 lb. ..	..	5 to 6 ..	Plantings in the Mackay-Bowen area are made usually after the summer wet season

* *See* footnote on page 327.

CENTRAL DISTRICTS—*continued.*

SOWING AND PLANTING TABLE FOR FIELD CROPS.

(This Table requires to be adapted to suit individual circumstances.)

Crop.	Main Purpose for Which Grown.	When to Sow or Plant.		How Sown or Planted.				Approximate Period of Growth of Crop in Months.	Remarks.
		Coastal Districts.	Tableland and Inland Districts.	Distance Rows Apart.	Distance Between Plants.	Quantity of Seed per Acre if Drilled.	Quantity of Seed per Acre if Broadcast.		
				Ft. in.	Ft. in.				
Rape	Green feed	Mar. to May	Mar. to May	Drilled	..	5 to 6 lb.	6 to 8 lb.	2½ to 4	..
Rice, Swamp	Grain	Oct. to Jan...	Oct. to Jan...	Drilled	..	80 to 120 lb.	..	4 to 5	Requires constant flooding during growing period
Rice, Upland	Grain	Oct. to Jan...	..	Drilled	..	60 to 90 lb.	..	4 to 5	..
Rye	Grain and grazing	Mar. to June	Apr. to June	Drilled	..	¾ to 1 bus.	1 to 1¼ bus.	3 to 5	..
Sorghum, Grain	Grain; stubble grazing	Sep. to Feb...	Sep. to Jan...	14 to 42 in.	..	4 to 12 lb.	10 to 20 lb.	3½ to 5	Immature growth of this group may contain poisonous properties; care should be exercised in grazing
Sorghum, Sweet	Green feed	Sep. to Feb...	Sep. to Feb...	3 6	0 4	5 to 6 lb.	12 to 15 lb.	3½ to 5	
Sudan Grass	Grazing and hay	Sep. to Feb...	Sep. to Jan...	Drilled	..	8 to 10 lb.	10 to 14 lb.	2 to 4	
Soybean*	Seed, grazing and hay	Sep. to Jan...	Oct. to Jan...	2 6	4 to 6 in.	15 to 20 lb.	25 to 35 lb.	3½ to 4½	For green manure purposes, *see* under "Leguminous cover crops"
Sunflowers	Seed for oil and bird seed	Sep. to Jan...	Sep. to Jan...	28 or 35 in.	1 0	4 to 6 lb.	..	4 to 5	Wider spacings and less seed per acre where hand harvesting adopted
Sweet Potato	Market and stock food	Sep. to Feb...	Sep. to Dec...	4 0	2 0	Cuttings used	..	4 to 5	Plantings in the Mackay-Bowen area are made usually after the summer wet season; useful for pig grazing
Tobacco	Leaf	Sep. to Dec...	Sep. to Dec...	4 0	18 to 24 in.	⅛ oz. in seed-beds	..	3 to 4 from transplanting	Plants must be raised in specially prepared seed-beds, and transplanted to permanent positions when strong enough
Turnip (including Swede)	Market and stock food	Feb. to May..	Feb. to May..	2 0	1 0	1½ to 2 lb.	3 to 4 lb.	4 to 5	..
Vetches or Tares*	Grazing	Mar. to June	Mar. to June	Drilled	..	30 to 40 lb.	40 to 60 lb.	3 to 4	For green manure purposes, *see* under "Leguminous cover crops"
Wheat	Grain, grazing and hay	Apr. to June	Apr. to July	Drilled	..	⅔ bus.	1 to 1⅓ bus.	3 to 6	Fodder purposes only on coast, where rust resistant varieties are recommended

* *See* footnote on page 327.

[TO BE CONTINUED.]

Control of Wild Tobacco Tree on the Atherton Tableland

By S. R. WALSH, Adviser in Agriculture.

(1) Wild tobacco tree may be satisfactorily controlled with hormone sprays.

(2) Best results are obtained on vigorous young plants up to 2 feet in height.

(3) It is essential to cover thoroughly all leaves of the plant.

(4) Old plants should be brushed and the regrowth sprayed.

(5) Follow-up treatment is essential to ensure complete success.

(6) Brushing alone gives no satisfactory control.

(7) Hormone-spraying is more economical than brushing and swabbing with either hormones or kerosene.

(8) "Ringing" with power kerosene could be the most effective means of control under conditions of continuous wet weather.

Wild tobacco tree (*Solanum auriculatum*), also commonly referred to as wild tobacco bush, occurs throughout the tropics and near-tropics of the world.

It may be classed as a small shrub or tree growing to 20 ft. in height. The leaves are ovate, 6-18 in. long and 2-8 in. broad. The bark and leaves are covered with fine grey hairs.

The flowers are blue to purplish in colour and are borne in a cluster on the end of a stalk which may be up to 9 in. in length.

The berries when ripe are yellowish in colour, and each contains hundreds of small, dark-yellow seeds slightly larger than a cabbage seed.

The plant reproduces freely by seed, and owing to the large number produced, neglected pasture land in the tropics may rapidly become heavily infested with this pest.

DISTRIBUTION.

This plant thrives on the red volcanic soils in the higher rainfall belt of tropical and subtropical Queensland. It can, however, adapt itself to a variety of soils. On the Atherton Tableland it is found on the red basaltic soils of Millaa Millaa, Ravenshoe, Atherton and East Palmerston, as well as on the granitic soils of the Barrine area.

In addition to infesting the fringes of scrubs and newly-burned scrub land, wild tobacco (with other weeds) frequently follows an infestation of white grub in the paspalum pastures on the Atherton Tableland; it is also a serious pest in neglected or overstocked pastures.

ECONOMIC IMPORTANCE.

Wild tobacco is reputed to be poisonous to stock but no cases are on record where death of stock has been definitely traced to this plant.

Its principal economic importance is its infestation of pasture land in established dairying areas and of newly cleared scrub land intended for dairying.

Plate 1.

Typical Growth of the Wild Tobacco Tree on the Atherton Tableland.

PREVENTION OF INFESTATION.

In established pasture, controlled stocking, subdivision, and rigid weed-control measures will assist in preventing an infestation of this pest.

As plant establishment occurs by seed, encroachment may be prevented by the eradication of isolated plants before they reach the flowering stage.

By controlled stocking and subdivision, greater use is made of the pasture and the better grass species are not overgrazed. A thick ground cover is thus maintained and this prevents the development of wild tobacco seedlings.

Rotational grazing of stock on weed-free pasture not only assists in maintaining a healthy stand, but also results in higher farm returns.

Molasses and kikuyu grasses give a particularly good ground cover. Molasses grass is ideally suited for sowing in conjunction with other pasture species on new burns. The molasses grass gives a quick ground cover and will smother young wild tobacco plants as they occur. In addition to this, molasses grass provides much useful feed a comparatively short time after sowing.

It must be realised that once an area has been grazed by stock the opening up of tracks through the grass will allow wild tobacco seed to germinate and develop much more readily. Some means of eradication of the young seedlings is then a necessity if the pest is to be kept in check.

CONTROL BY MECHANICAL MEANS.

Under this heading may be mentioned grubbing, brushing and the use of farm machinery. Within the last category may be included ploughing and pulling by a tractor equipped with a specially-made eradicator. Rolling or breaking down with a bar attached low to the front of a tractor would assist in reducing heavy growths, but the regrowth from this treatment would require to be sprayed.

(*a*) *Grubbing* is best confined to isolated plants where the use of sprays would not be economically warranted.

(*b*) *Brushing.*—While brushing gives a temporary control, it is by no means satisfactory and invariably results in a thicker stand the following season. Suckering of brushed wild tobacco plants takes place rapidly from both the stump and the roots. It is therefore foolish to rely on brushing alone as a means of control, particularly where a heavy infestation has occurred.

(*c*) *Ploughing.*—Where wild tobacco growth is not too heavy or old, good work can be done with the disc plough. By following with the disc cultivator and sowing down to a crop, land otherwise useless can be brought into production. If cropping is continued for several years, and the land then resown to grass, a good clean pasture will result.

(*d*) *Pulling.*—Pulling by means of a lantana eradicator is an effective method for medium to large plants. This implement consists of a set of specially-made tines attached to a

Plate 2.

Old Growth of Wild Tobacco on the Atherton Tableland. This thicket has reached a height of over 20 ft.

Plate 3.

Wild Tobacco Invading an Old Paspalum Pasture on the Atherton Tableland. Invasion of this weed is a common result of neglect or overstocking.

Plate 4.

Molasses Grass Overgrowing a Wild Tobacco Seedling on a Scrub Burn. This picture was taken one year after the grass was sown. A good smothering grass of this nature will check the growth of this weed, but not if the grass is overgrazed.

boom controlled by a power-lift mechanism. Once the operator has become accustomed to handling this implement fairly rapid progress can be made. Even in thick stands of wild tobacco an acre per day may be pulled.

With mechanical methods, however, it is almost impossible to obtain a kill of all plants. Following up with sprays on regrowth or seedling growth is nearly always necessary.

CHEMICAL CONTROL.

Chemical control has been achieved by the use of power kerosene (alone or mixed with diesel distillate), and more recently by the use of hormone weedicides. These two classes of compounds will be dealt with hereunder.

Control by Power Kerosene.

Power kerosene may be used in two ways: (*a*) by swabbing the stumps after brushing, and (*b*) by "ringing" the trunks of standing bushes near the butt.

When swabbing is adopted, the kerosene is applied to the stump with a soaked rag or a brush, or by pouring a small amount over the stump. Best results are obtained if the plant is brushed close to the ground and sufficient kerosene is applied to allow some to run down the outside of the bark.

The rate of application varies somewhat but is approximately ½ to ¾ gallon for 50 plants. The percentage of control for one treatment varies from 50 to 60 per cent. Brushing and swabbing, two men can treat approximately 100 plants in an hour.

The main disadvantages of this method are—

(1) Suckering may occur from the roots; at times up to 5 suckers will appear.

(2) In heavy infestations a number of small hard stumps remain which could be a possible source of injury to stock.

(3) There is a considerable waste of kerosene.

In the "ringing" method a small amount of power kerosene is poured on the ground in a ring round the trunk of the bush. The method of application is with a bottle, or a tin or watering-can fitted with a very small outlet. To be effective it is essential that the plant be completely ringed with kerosene. This method gives approximately 70 to 80 per cent control. The rate of application varies with the size of the plant, but generally ranges from ½ to 1½ gallons per 50 plants.

This method is somewhat slower than brushing and swabbing, particularly in a very thick stand. It is worth while on large scattered plants, but on smaller and denser growth it has less to recommend it. One of the difficulties with this system is to follow a line through in a thick stand; consequently some plants may be missed. Treated plants may take up to seven months to die.

The method has its advantages in continuous wet weather when conditions are unsuitable for the use of hormone sprays.

Control by Hormones.

(1) Hormone Sprays.

This is the most satisfactory method of control, giving from 95 to 98 per cent. kill. In some instances complete kills have been achieved but it is almost always necessary to go over the area again for missed bushes and for regrowth from plants not completely sprayed.

Hormone sprays, of either 2,4-D or a mixture of 2,4-D and 2,4,5-T, have given satisfactory results.

Plate 5.

Wild Tobacco Invading a Young Molasses Grass Pasture Following Grazing. The grazing has thinned the grass cover and opened up tracks, thus enabling the weed to establish itself. Hormone spraying should be carried out at this stage.

Plate 6.

Brushing of Larger Plants of Wild Tobacco has Resulted in Regrowth which is at the Right Stage for Spraying.

The sprays may be applied by either a knapsack spray or a spray pump driven by the power take-off of a tractor or an independent engine. Spraying from the power-type spray is done by one or two long hoses giving a radius cover of 60 to 100 ft. Many of the commercial types of power spray plants on the market give satisfactory results.

When using hormone sprays the best results are obtained when soft, vigorously-growing, young plants are sprayed. It is necessary to brush the older woodier plants and spray the regrowth. Another advantage when small plants are sprayed is that less spray is used.

A 0.2 per cent solution gives good results on young wild tobacco.

Where a 50 per cent. concentrate of 2,4-D is used, this should be diluted at the rate of 1 gallon in 250 gallons of water. When using a knapsack, 2 fluid ounces should be added to 3 gallons of water to give a similar concentration.

When using a 40 per cent. concentrate mixture of 2,4-D and 2,4,5-T, the rate of mixture for a 0.2 per cent. concentration is 1 gallon in 200 gallons of water. At times on very soft growth a concentration of 1 gallon to 300 gallons of water may be used.

Directions for mixing are printed on the containers by all manufacturers; if these are carefully followed no mistakes should be made.

The following points are essential for the satisfactory use of hormone sprays:—

(1.) If so directed, thoroughly stir the hormone concentrate before adding it to the water; this applies particularly to one of the 2,4-D preparations.

(2) Use only clean water.

(3) Thoroughly wet all foliage with the spray.

(4) Spray systematically so that no plants are missed.

(5) Avoid spraying during rain or immediately after rain while the leaves are wet.

(6) Do not spray if rain is likely to fall within 2-3 hours.

(7) Do not spray in the heat of the day in hot dry weather; under these conditions evaporation is high and absorption by the leaves is reduced.

(8) Best results are obtained when soft, young, vigorous growth is sprayed.

(2) Swabbing Following Brushing.

Good results have also been achieved by brushing large wild tobacco trees and swabbing the butts with a hormone mixture. This mixture must be of a higher concentration than that used for spraying.

A 1 per cent. mixture is recommended for this method, and to obtain this dilution the following rates are used:—

50 per cent. 2,4-D concentrate—1 gallon made up to 50 gallons with water.

40 per cent. 2,4-D + 2,4,5-T concentrate—1 gallon made up to 40 gallons with water.

The rate of treatment is similar to that used when swabbing with kerosene. Plants treated by this method may take from four to seven months to die.

Cost of Treatments.

Spraying—A 2,4-D 50 per cent. concentrate costs £2 9s. to £2 17s. 6d. per gallon (early 1956 figures). At a dilution of 1 in 250, the spray costs about 2½d. to 3d. per gallon.

A 2,4-D + 2,4,5-T 40 per cent. concentrate costs £3 16s. to £3 17s. per gallon (early 1956 figures). When

Plate 7.

The Result of Spraying Regrowth after Brushing. The regrowth was sprayed 6 days prior to taking this picture and a complete kill has resulted.

Plate 8.

A Mature Wild Tobacco Tree 8 Months after Ringing with Power Kerosene. Treatment has been wholly effective on this tree, but some green leaf remains on a similarly treated tree at the right.

Plate 9.

Results of Ringing with Kerosene 8 Months Previously. This tree has been completely killed by the treatment as a result of rotting of the roots.

diluted at the rate of 1 in 200, this material costs about 4½d. per gallon of spray.

Swabbing.—Since the rates of treatment are similar with power kerosene and with hormone, the costs per gallon of material would bear the same relationship to each other as the costs per acre or for a given quantity of wild tobacco. These costs, of course, are for materials only and do not include labour.

Power kerosene, at £5 7s. 3d. per 44-gallon drum, costs 2s. 5¼d. per gallon.

2,4-D 50 per cent. concentrate at 1 in 50 dilution costs from 11¾d. to 1s 2d. per gallon.

2,4-D + 2,4,5-T 40 per cent. concentrate costs approximately 1s. 11d. per gallon.

These costs certainly favour the hormone preparations, when the brushing and swabbing method is applied.

Availability of Hormone Weedicides.

While hormone weedkillers in a number of different brands are readily available throughout the State, a special selling service is provided by the Department of Public Lands. This Department supplies certain brands of hormone to landholders *at cost price,* and freight free to the nearest rail centre. Enquiries regarding this service may be addressed direct to the Secretary, Land Administration Board, Brisbane, or made at any District Land Office.

European Foul Brood of the Honeybee

By C. ROFF, Adviser in Apiculture.

European foul brood, an infectious disease of bees, was found for the first time in Queensland in one hive of an apiary near Warwick during April, 1950. The disease has caused heavy losses, particularly amongst black bees, in other parts of the world.

The disease is caused by a bacterium (*Bacillus alvei* White) which infects young larvae of all three castes. The infection may cause a serious reduction in the number of workers emerging from the combs, with consequent decline or death of the colony.

Nurse bees play an important part in spreading European foul brood within the hive. In a dearth period, the juices of dead infected larvae are sucked up by the nurse bees and incorporated with food, which is then fed to other larvae. The practice of equalising colonies by exchanging brood combs spreads the disease within the apiary.

Robber bees, by taking new honey placed in cells which recently contained diseased larvae, are also responsible for hive-to-hive infections.

Contaminated honey after storage for three months has not proved a fruitful source of infection.

Overseas experience indicates that the disease is unlikely to be transmitted by equipment such as hives and tools or by the clothes or hands of the beekeeper unless infected honey is directly robbed from such sources.

Features of the Disease.

European foul brood is most noticeable in weak colonies of common black and hybrid bees. Italian bees are seldom affected, and this is one of the reasons for the early popularity of this race.

Brood is likely to be infected during any season of the year. However, the severity of the disease in a colony is governed to some extent by the quantity of food available. In regions where the main honey flow is experienced during spring or early summer, European foul brood causes practically no losses.

A honey flow supplying nectar continuously tends to hasten recovery of infected colonies; the bees are more vigorous and will quickly remove diseased material from the hive. In colonies where self-recovery has apparently taken place, re-appearance of the disease the following year often occurs, and in the meantime spread to other colonies is likely.

Infected honey is not injurious to humans.

Symptoms.

In diagnosing the disease the following points should be checked before coming to the conclusion that European foul brood is present. It is obvious that a newly infected colony will not exhibit all the points enumerated.

(1) The colony is noticeably weak.

(2) Decaying larvae and scales are removed by the bees, with the result that a frame of brood assumes a speckled or mottled appearance, due to the presence of empty cells. This irregular appearance becomes more pronounced as the disease develops.

(3) This disease is essentially one of unsealed brood, the majority of larvae dying usually within five days after hatching from the egg. Occasionally some larvae survive until the cells are sealed. Sunken and perforated cappings may be observed, but this is by no means common.

(4) Instead of remaining in the normal coiled position typical of young healthy larvae, those infected become restless, move about inside the cells, and occupy a variety of unnatural positions. The irregularity of the positions of larvae is an important symptom.

(5) The plump glistening appearance of healthy brood disappears. The earliest noticeable change in diseased larvae is a slight yellowish or yellowish-grey discolouration accompanied by the collapse of the larvae. At this stage larvae are translucent and watery, before becoming pasty and sticky or porridge like. Occasionally decayed material may rope; the thread of the material that ropes out is coarse and lumpy in consistency. Finally, diseased material dries into a yellowish, greyish or nearly brownish-black scale.

A very distinct characteristic of this disease is the lack of adhesiveness of the decomposing material, especially of the scale to the cell wall. This feature enables strong colonies to remove the diseased material from the cell.

(6) The odour of diseased material may be slightly sour or yeasty, or the material may develop a repulsive carrion odour.

Preventive Measures.

If the following measures are carried out very little loss will be incurred from European foul brood.

(1) Introduce a hardy strain of the Italian race of bees.

(2) Requeen at least every two years.

(3) Maintain colony strength by providing the food, hive space and protection required for each particular period of the year.

Treatment of Infected Colonies.

Several methods of treating the disease are practised overseas where the disease is firmly established. Where the disease is widespread, methods adopted are those of minimisation and not of eradication. In Queensland, effective eradication is desired. The present negligible losses caused by this policy are justified in view of the substantial losses that would be suffered by the industry generally if the disease became established.

Diseased hives should be handled in the following manner, which is the most economical:—

(1) The destruction of diseased colonies should take place in the evening when all the bees are in the hives.

(2) Dig a pit of a size suitable for the number of colonies to be destroyed.

(3) Kill all bees in the diseased hives with calcium cyanide; about two teaspoonfuls of the poisonous powder should be put through the entrance of each hive before closing it. *Extreme care should be taken to avoid inhaling the poisonous gas given off by the cyanide.* If calcium cyanide is not readily available, the hive entrance should be closed, a pint of petrol sprinkled over the top frames, and the top cover replaced.

(4) Build a fire in the pit, and as soon as it is burning well, add the dead bees and combs. The only parts of the hives not to be burnt are the bottom boards, the hive bodies of the brood nests, the bodies of the extracting supers, and the top covers. Care should be taken in burning the petrol-soaked material.

(5) Scrape the inside surfaces of the unburnt parts of the hives and burn the debris.

(6) After all diseased material has been burnt, spade the ground down, refill the pit, and pack well.

(7) Sterilize the undestroyed contaminated hives and hive parts by either boiling for half an hour in 1 per cent. caustic soda solution or scorching to a dark-brown colour with a blow torch all the inner surfaces and edges.

Legislative Requirements.

Under *The Apiaries Act of* 1947 it is provided that any beekeeper in whose apiary any disease appears shall immediately notify, in writing, the Under Secretary, Department of Agriculture and Stock, Brisbane.

Irrespective of the legal requirements, any beekeeper who notices unusual brood symptoms in his apiary should, for his own sake, communicate with the Department.

MOLYBDENUM SPRAYS FOR CUCUMBERS AND ROCKMELONS.

No matter how liberally fertilizers are applied to vegetable crops, plant growth may still remain unsatisfactory if trace elements such as molybdenum are in short supply in the soil.

Spring crops of cucumbers and rockmelons are particularly susceptible to a deficiency of molybdenum, states Mr. C. N. Morgan, Senior Adviser in Horticulture, Department of Agriculture and Stock. The symptoms are unmistakable. Growth of the young plants is slow, the leaves lack the normal green colour and tend to crimp, and marginal patches die.

When these symptoms are detected in a young stand an immediate response follows the application of a spray of ammonium molybdate or sodium molybdate. However, even when the deficiency is corrected and the plants resume normal growth, the early setback will delay crop maturity for a period of three or four weeks. This may deprive the grower of the remunerative prices for early crops of cucumbers and rockmelons.

In practice, therefore, it is better to assume that the soil is deficient in molybdenum and to apply the ammonium molybdate spray shortly after germination is completed. The cost is low and the spray can be quickly applied. On some soils where molybdenum deficiency is acute, a second spray may be needed later in the growing period, but this should only be applied if typical symptoms of the deficiency appear in the plants.

The spray can be prepared by dissolving $\frac{1}{2}$ oz. of ammonium (or sodium) molybdate in a knapsack pump of about $3\frac{1}{2}$ gallons capacity. The amount required per acre varies with the density of foliage, and ranges from five to 20 gallons. Thorough coverage is not necessary; wetting of the upper surface of the leaves is adequate. The operator can move at a steady walking pace along the row, provided the fan-shaped jet of spray fluid from the nozzle covers the whole of the plants.

The Honey Flora of South-eastern Queensland

By S. T. BLAKE (Botanist) and C. ROFF (Adviser in Apiculture), Science Branch.

(*Continued from page 206 of the April issue.*)

WHITE BOX.

Botanical Name.—This species has usually been called *Eucalyptus albens* Miq., but its correct name is still under investigation.

Distinguishing Features.—A tree with grey "box" bark below and smooth white or pale grey bark above, twigs with a waxy bloom, and silvery leaves on long stalks (Plates 154-155).

Plate 154.

White Box (Eucalyptus sp.). Branchlet showing leaves, buds and flowers.

Description.—This is a tree up to 50 ft. with grey "box"-like bark on the trunk and smooth whitish bark on most of the branches. The twigs have a waxy bloom. The leaves are whitish and have long stalks; they taper towards the tip, and are about 4–6 in. long, $\frac{1}{2}$–$1\frac{1}{4}$ in. wide, 3–8 times as long as wide. The flowers are borne in stalked bunches towards the ends of the twigs and are about $\frac{3}{4}$ in. wide when

Plate 155.

White Box (Eucalyptus sp.) Waroo.

fully open. The buds are whitish, about $\frac{3}{4}$ in. long, widest at the middle, tapering to a short stalk, with a pointed lid about as long as the rest of the bud. The stamens are cream-coloured. The seed-capsules are barrel-shaped, silvery, about $\frac{1}{2}$ in. long and $\frac{1}{4}$ in. wide, with deeply enclosed valves.

Distribution.—Darling Downs District, mostly scattered, often on black soil. Also in New South Wales, Victoria and South Australia.

Usual Flowering Time.—April–July.

Colour of Honey.—Light amber—slightly cloudy.

Importance as Source of Honey.—Major.

Importance as Source of Pollen.—Medium.

General Remarks.—Although supplies of pollen are obtained, heavy losses of bees have occurred when this species is worked. Affected colonies remain seriously weakened for many months, and accordingly some beekeepers now avoid white box locations.

The honey, which is one of Queensland's choicest, has reasonable density and excellent flavour, and candies quickly with a smooth creamy texture. There is a strong demand for this honey as a starter for candied or creamed honeys.

[TO BE CONTINUED.]

Lambing Losses

By G. R. MOULE (Director of Sheep Husbandry), M. N. S. JACKSON and R. B. YOUNG (Senior Advisers in Sheep and Wool).

Every three years, Queensland loses a whole drop of lambs. But that does not mean we have drought every three years. Certainly lamb losses are heaviest during dry years, but even in good years they continue to take their toll.

Recently research by officers of the Sheep and Wool Branch has shown how serious lamb losses can be. About one-third of all the lambs born die before reaching marking age.

Of course there are exceptions; if lambing ewes can be looked after carefully and kept on good feed in small paddocks, lamb losses will be reduced. They may fall to as low as 10 or 12 per cent. of all lambs born. If a drought occurs or if lambing ewes are disturbed by mustering, many lambs may be lost.

These are details of management every woolgrower has to work out for himself. Obviously, it would be possible for stud masters to lamb their top ewes under intensive conditions. It should be equally possible for flock owners to manage their properties so that lambing ewes are not disturbed.

But let us examine the problem of lambing losses as it affects the State's flock. During the last three years, 20 million Merino ewes were mated in Queensland. Ten-and-a-half million lambs have been marked—an average of 3½ million a year. It is highly probable that during the same three years another 3½ million lambs died before they attained marking age. It would not have been possible to save all these lambs. Suppose we had saved only half of them. Our flock would have been greater to-day by 1¾ million sheep. And those extra sheep could have already earned something like £17½ million for the sheep industry.

DIFFERENT KINDS OF LAMBING LOSSES.

Most woolgrowers know that in some seasons they lose a lot of ewes at lambing time. This is serious; you lose both the lamb and its mother. Apart from the ewe's value as a mother you also lose a wool cutter.

Few woolgrowers know how many lambs they lose between birth and marking.

In a recent survey, the opinion of sheep men was sought about the extent and cause of lamb losses between birth and marking. Most men considered their losses varied in an average year between 5 per cent. and 12 per cent. of the lambs born. One property owner was able to quote reliable figures to indicate that the losses of his stud lambs before marking had aveaged about 12½ per cent. a year, but agreed that they were sometimes higher.

Many men quoted some disastrous results. They had occurred during drought years, or when lambing took place during extremely hot weather. Sometimes losses were due to dingoes attacking the lambing ewes. In one stud flock only eight lambs, from 200 known to have been born, survived to marking time. On another occasion 600 lambs from a flock of about 800 perished on a waterhole during a heat wave. Such losses are both spectacular and serious, but the lesser, but more constant losses, that occur each year are probably more important.

There are two kinds of losses to consider then—those involving both the ewe and her lamb, and those involving the lambs only.

THE LOSS OF EWES AND LAMBS.

Intensive studies that commenced in 1948 have shown that given reasonable seasons and good management, comparatively few ewes will die during lambing time. During these investigations, 2,211 Merino ewes were observed during lambing. Only very few died at lambing time. The majority of these ewes were in the prime of life; few were older than 6 years. Had the ewe flock been older, heavier losses may have occurred.

The principal causes of ewe losses are worth examining.

(1) Ewes Unable to Lamb.

It is well known that ewes in Queensland may experience difficulty in lambing, but the cause of this trouble is not well understood. Being overfat can be an important contributing cause amongst crossbred ewes in the fat lamb areas, but on the other hand, extreme poverty may cause trouble amongst Merino ewes in the drier pastoral country.

The "bearing troubles" most commonly encountered are turning back of one or both front legs, and of the head. They are often difficult to detect and handle amongst flock sheep, but valuable stud animals can be saved by timely and carefully applied assistance. If they remain unattended the lamb is most commonly strangled during birth.

(2) Pregnancy Toxaemia.

Pregnancy toxaemia is fairly common amongst breeding ewes in Queensland. It can be a serious cause of loss, as it is difficult to treat affected sheep. It usually occurs when ewes whose pregnancy is advanced are starved. This may occur during a rail journey or when light falls of rain followed by cold weather destroy the standing pasture.

Plate 1.

Ewe Showing Typical Signs of Pregnancy Toxaemia.

Plate 2.
Ewe Down with Pregnancy Toxaemia.

Pregnancy toxaemia may reach "outbreak" proportions in a flock and it usually occurs amongst ewes that have not lambed. Affected sheep stand about in a listless fashion, appear to be blind, are disinclined to feed, but may grind their teeth. The course of the disease is protracted and sick ewes (Plates 1 and 2) may linger for seven or eight days before dying. Sometimes affected sheep abort, but the ewes seldom survive.

Preventive measures obviously include the careful management of pregnant ewes and, where necessary, supplementary feeding.

(3) Milk Fever (Hypocalcaemia).

In some ways the history and symptoms of milk fever may resemble those of pregnancy toxaemia. However, it is easy to treat animals suffering from this condition. It is caused by a sudden decrease in the amount of lime (calcium) circulating in the blood. Therefore, affected animals will respond quickly to injections of the drug calcium borogluconate.

Milk fever may occur frequently amongst ewes brought in for pre-lambing crutching or when they are held in the yards for any other reason. Sometimes cold, windy weather, worm infestations or eating certain poison plants may cause milk fever. In these circumstances the sheep are often "in hand" when it occurs.

It can usually be recognised by the quickness of its course and the almost immediate recovery following subcutaneous injections of from 1½ to 2 ounces of 20 per cent. solution of calcium borogluconate. If the ewes are not treated they usually die.

Affected sheep have a staggering gait. They soon "go down" and although they appear lifeless their limbs may be quite stiff and hard to bend. As the sheep lie on their sides, fluid runs out of their nostrils. Sometimes the ewes make a snoring noise when they breathe. Their eyes become glassy and affected sheep may die in 24 hours or so if they remain untreated. Plate 3 shows a ewe down with milk fever.

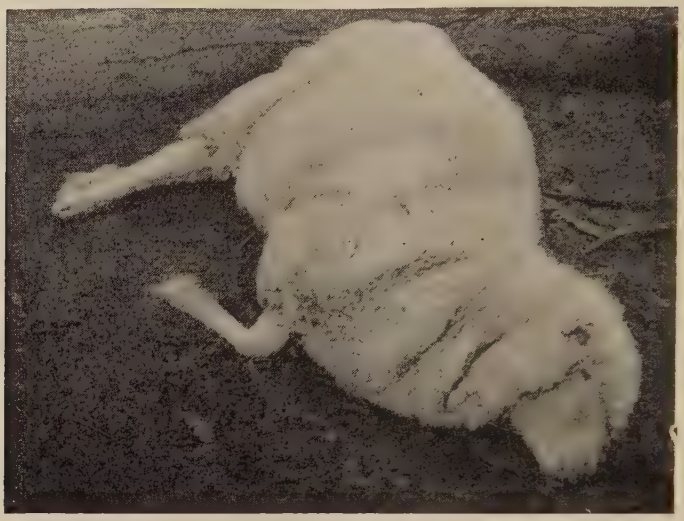

Plate 3.

Ewe Suffering from Milk Fever.

Plate 4.

Teats and Udder of a Ewe Suffering from Mastitis.

Note the blackish, inflamed teats.

(4) Mastitis.

Mastitis is the name given to inflammation of the udder. Although this disease is well known amongst dairy cows it is probably more common than is generally imagined amongst ewes. A few cases have been observed amongst ewes kept under close observation at lambing time, and the disease has reached outbreak proportions on some properties.

Mastitis may occur in a mild, uncomplicated form or it may be complicated and serious. In the former case the disease is not particularly important to the ewe. There is a decrease in the amount of milk available for the lamb and the affected half of the udder may become permanently blind. However, this may have serious effects on the survival and growth of lambs.

In its complicated form mastitis may lead to the death of the ewe. The udder becomes bluish-black in colour and the affected ewe usually shows great distress and lameness in her hind legs; she breathes rapidly and her temperature is high.

Prompt treatment, which consists of the administration of the drug sulphamezathine at the rate of 1 gram for every 15 lb. weight or the infusion of solutions of calcium penicillin into the udder, is necessary in most cases to save affected animals.

(5) Accidents Associated With Lambing.

Most experienced sheep men are familiar with the accidents which may befall ewes at lambing time. They include an eversion of the breeding passage, or of the whole breeding bag, or rupture of the "skirt muscle" which separates the chest cavity from the belly. Although spectacular, these conditions do not usually account for a very large proportion of the ewes that die at lambing time. However, as most of these conditions are fatal the lamb is left as a "poddy" before he is old enough to survive.

(6) Acute Blood Poisoning.

Acute blood poisoning sometimes occurs through virulent, disease-producing bacteria gaining entrance to the breeding bag at lambing time. This condition is usually fatal within a few days and in most cases treatment is of little avail. Fortunately, it is not very common amongst ewes but when it occurs it usually kills the ewe before her lamb is old enough to survive without its mother.

LAMB LOSSES.

The 2,211 ewes that lambed under observation during the 3-year study recently undertaken in Queensland produced 2,467 lambs. Of these, 453 died at or within three days of birth. Further losses occurred between the end of the third day and marking. They ranged between 8.5 per cent. and 69 per cent. of the lambs that survived birth and the first three days of life. The average loss during this period was about 15 per cent. of the lambs that survived for the first three days. The serious loss of 69 per cent. occurred in one observation during the exceptionally heavy summer rains of 1950.

The numbers of lambs that died at birth and on each of the first three days of life during the studies in Queensland are shown in Plate 5. You will notice only 141 lambs died at birth while 204 (almost half of all that died) did so during the first day. The losses decreased rapidly during the second and third days.

(1) Exposure at Birth.

Exposure was by far the most important cause of loss at birth. Some lambs were born during very heavy summer rains when the ground was boggy. They were unable to get up and soon died. Others were born during the month of May when the weather was dry but cold. Frost is unlikely to affect new-born lambs as much as cold drying winds. These cause the moisture in the lambs' birth-coats to evaporate so quickly that the lambs soon freeze to death.

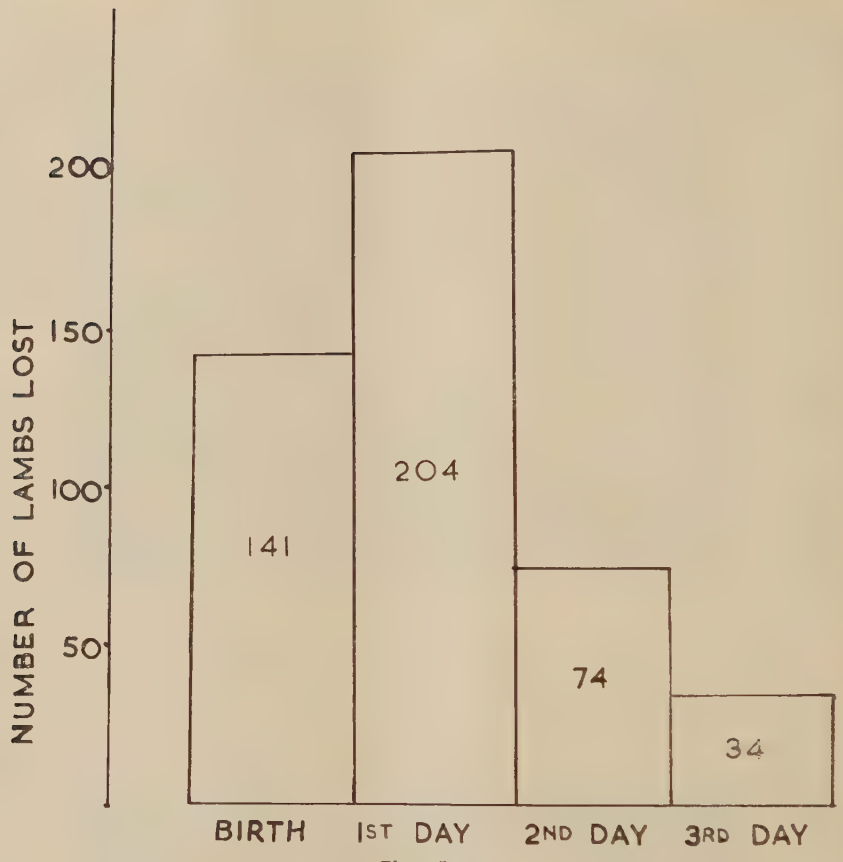

Plate 5.

Diagram Showing the Lamb Losses at Birth and During the First Three Days. The number of lambs lost is indicated by the height of the blocks, the actual number being shown inside each block.

Accidents during birth and bearing troubles were the next most important cause of losses at birth. Together they accounted for the deaths of about 45 lambs (about one-third of the lambs lost at birth, but only one-tenth of all the lambs lost at birth and during the first three days). This loss of 45 lambs due to lambing troubles represents less than 2 per cent. of all the lambs born.

(2) Starvation and Predators.

Starvation and predators were the most important causes of loss during the first three days of life.

Wild pigs and crows were the most important predators. Pigs are merciless in their attacks upon baby lambs. Crows take their tongues and their eyes. In these studies, foxes and eagle hawks did not account for so many lambs, but in other circumstances they might quite easily do so.

Starvation kills many very young lambs. Many ewes have faulty udders; some do not make milk readily at about lambing time. It is essential that lambs have their mother's first milk soon after they are born. It is also essential for them to have ample milk—up to a pint and a half a day by the time they are a week or so old. Lambs that do not obtain milk within a few hours of birth become listless and soon die. Those that do not have sufficient milk for the first three days become very weak. They are unable to keep up with their mothers and are soon lost.

Between them starvation and predators accounted for 290 of the 453 lambs lost within three days of birth. During the same time exposure accounted for another 100, so that predators, starvation and exposure to the rigours of Queensland's pastoral environment were the principal killers of young lambs. But let us examine this question of starvation more carefully.

The Causes of Starvation.

The ewe's udder is an all-important, but somewhat neglected organ. No fewer than 22 per cent. of all the ewes whose lambing was observed in Queensland had abnormal udders. The occurrence of the abnormalities varied between flocks. In one, 10 per cent. of the ewes had abnormal udders; in another, 33 per cent. had abnormal udders.

Shearing wounds, such as blindness from cutting one or both teats, were by far the most important cause of abnormal udders. Other abnormalities included extremely enlarged teats, sometimes resulting from old attacks of mastitis, plugged teats and lack of milk. Small plugs of a waxy substance sometimes form in the teat orifice, and they may become so tightly wedged that the lamb is unable to dislodge them. So although there is ample milk, the lamb is unable to obtain it and death soon follows.

A poor flow of milk may result from one of two causes. It occurs most commonly when ewes do not have enough to eat to ensure a full flow. The ewe has to eat a good deal of extra food to produce a lamb and the milk it requires and to grow a fleece as well. So often ewes lamb on pastures that do not provide sufficient nutriment for all these functions. The growing lamb the ewe carries in her body takes first preference, and if there is insufficient food to make milk the lamb subsequently suffers.

Unfortunately, some ewes in Queensland lamb before full term. Several things can cause this to happen. When it does occur the ewe is without milk for her baby lamb.

Both insufficient food for the ewes and premature births mean small weak lambs. Sometimes they weigh less than 4 lb. when they are born. They are so

Plate 6.

A Lamb, Six Hours Old, Which Has Been Unable to Get a Drink of Milk Owing to Plugs in Its Mother's Teats.

light and weak that they are unable to suckle and soon starve to death. The season also has a marked influence upon the birth weight of lambs, but not in the way one would expect. Queensland sheep men follow one of two practices. Some mate the ewes in the autumn, so they lamb in the spring. In these circumstances, the ewes are pregnant during the winter. Others, especially those in north-western Queensland, mate their ewes in the spring to lamb in the autumn. They are pregnant during the summer.

You would have every right to believe that lambs dropped on to green feed in the autumn would be bigger than those dropped in the spring on to dry feed. The observations made since 1949 in north-western Queensland have shown that this was not the case. The spring lambs dropped on dry feed weighed on the average 7.0 lb. The autumn lambs dropped on to green feed weighed only 4.9 lb. Workers at the University's Physiology School subsequently showed that the hot weather common during the summer in north-western Queensland may cause ewes to have small lambs. This finding raises several problems in the management of ewe flocks in north-western Queensland.

Irrespective of seasonal conditions, ram lambs are usually heavier at birth than ewe lambs. Single lambs are heavier than twins and the lambs of mature ewes are frequently heavier than the lambs of maidens. It has also been found that some rams sire lambs that are definitely lighter than those sired by others. This difference may amount to as much as 1 lb. in the birth weights of the lambs.

The importance of low birth weight upon the survival of lambs is clearly seen from Plate 7.

The influence of abnormal udders upon the survival of lambs will be readily understood from the following figures. Only 10.3 per cent. of the lambs born to ewes with sound udders died during the first few days of life; 23.6 per cent. of the lambs whose mothers had abnormal udders died during the same period. In addition, the lambs whose mothers had abnormal udders did not grow as quickly as those whose mothers had sound udders.

These differences appear in their true perspective from the figures showing the survival of lambs through to marking. In all, 18 per cent. of the lambs that survived the first few days of life and whose mothers had sound udders were lost. Almost 27 per cent. of the lambs that survived the first few days of life and whose mothers had unsound udders died before attaining marking age.

WHAT MAKES EWES FORSAKE THEIR LAMBS?

Ewes will sometimes forsake their new-born lambs. While it is commonly considered that maidens are likely to do this through inexperience, older ewes may leave their lambs because of ill-health or poverty, or through faulty management.

(1) Ill-health.

The conditions of ill-health likely to make ewes forsake their lambs are pink eye, blowfly strike, crow peck, mastitis and foot-rot. Of these, there is probably little excuse for losses due to strike. This is illustrated in Table 1, showing the percentage of wet ewes in two groups, one subjected to blowfly strike, the other protected from strike by the Mules operation.

TABLE 1.

FERTILITY OF EWES, STRUCK AND UNSTRUCK.

Ewes.	Percentage Wet.	Percentage Lambs.
Not Mules operated, struck	75	79
Mules operated, unstruck	92	100

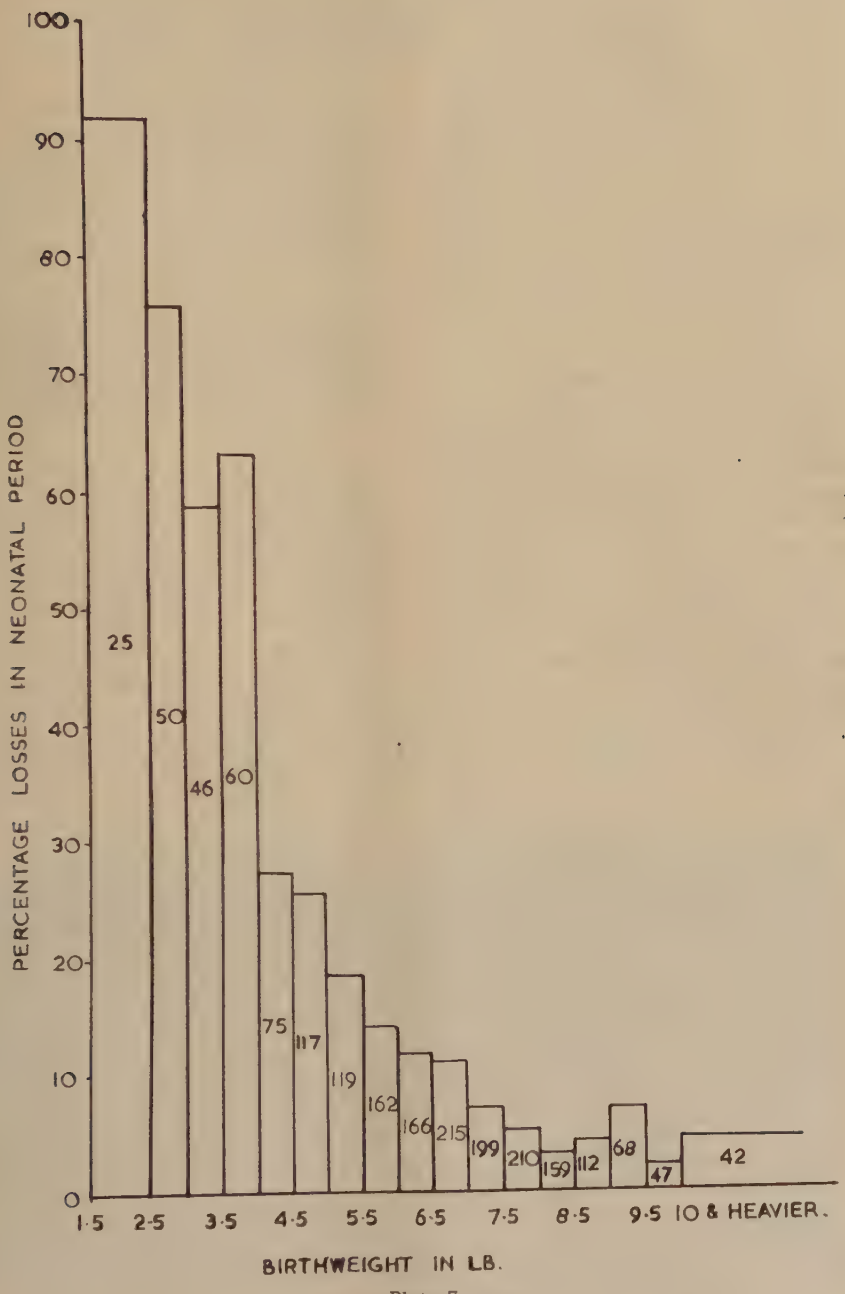

Plate 7.

Diagram Showing the Distribution of Deaths According to Birth Weight of the Lamb. The actual birth weights are shown on the scale across the bottom of the figure. The lambs lost, as a percentage of all those born in each weight group, is indicated by the height of each block. The percentage can be read off from the scale on the left. The figures inside the block shows the total number of lambs born in the weight group.

Table 2 shows how increasing number of strikes decreases the number of wet ewes.

TABLE 2.

EFFECT OF MULTIPLE STRIKES ON FERTILITY.

—	Number of Strikes.	Percentage Ewes Wet.
Mules operated ..	0	92
Not Mules operated..	1	88
Not Mules operated..	2	73
Not Mules operated..	3	58
Not Mules operated..	4	47

(2) Poverty.

During a drought, ewes may walk away from their lambs immediately they are born. While such a procedure is not conducive to high lamb-marking figures, it probably ensures the greatest chance of survival for the ewes. Naturally, good management aims at lambing at a time which is favourable for the survival of the ewe and her offspring, but this is often difficult to achieve in areas where rainfall is unreliable.

Sometimes when the season is unfavourable, but not a complete drought, ewes will try and mother their lambs. Despite this, many lambs may die for no apparent reason. This may be due to their suffering from vitamin A deficiency.

(3) Faulty Management.

Included under the heading of management are the factors that lead to unnecessary disturbance, such as too much handling, lambing in paddocks through which stock routes pass, and lambing in paddocks which are too large or too small. An important complication resulting from the last practice is that, contrary to popular belief, Merino ewes will adopt lambs to the exclusion of their own offspring (see Plate 8).

On the other hand, should the paddocks be too large and inadequately watered, young lambs may have difficulty in keeping up with their mothers when they go into water. This can result in heavy loss, especially in hot, dry weather. The concentration of large numbers of ewes on a single watering point can of course have the same effect as confining ewes in small paddocks. In these circumstances, adoptions occur frequently and many lambs may be lost.

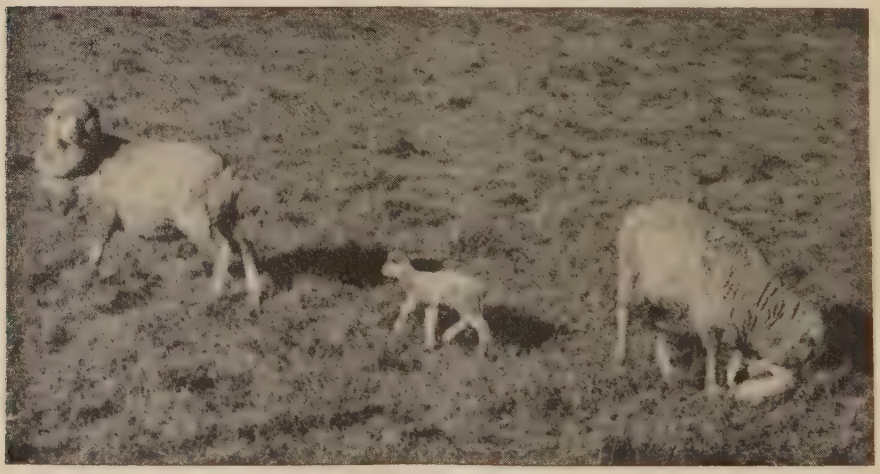

Plate 8.

A Case of Adoption. The ewe on the right is seen "adopting" the new-born lamb of the ewe on the left, to the exclusion of her own lamb, which is following the "displaced mother," who refused to adopt it as her own.

[TO BE CONTINUED.]

North Queensland Cattlemen! Buy Bulls for your Climate

By J. N. SHELTON, Assistant Husbandry Officer, Cattle Husbandry Branch.

If you want to breed a good racehorse, you don't use an unknown stallion on any old station mare.

Good cattle are more important to you than good horses. So why buy your bulls "on spec."? Far too many cattlemen buy bulls without even seeing them!

You can't wait until bulls are proven before you buy them. If a bull was proven you wouldn't be able to buy him except at a prohibitive price. But you can buy bulls which you know will be suitable to North Queensland.

At a bull sale you often hear people say, "None of these bulls is suitable for North Queensland." Perhaps they are right! But what type of bull *is* suitable for North Queensland?

The first point to remember is that conditions in North Queensland are vastly different from those in southern Queensland. You want bulls for your conditions.

A bull bred to make rapid weight gains on first-quality pastures or hand feeding may die in North Queensland. You want a bull that can withstand the tropical temperatures. He must be able to walk long distances for feed and water. He must be able to cover his share of cows under extensive range conditions.

If a bull can cope with your hard conditions, there is a good chance that his calves will do just as well.

We have all noticed among a mob of cattle some that are at ease in the heat and others that are showing distress. Which type of bull is comfortable on a hot day? The bull with a smooth glossy coat. The fellow with a woolly coat is most distressed. He is breathing very rapidly, panting and slobbering.

Say we put these two bulls in a crush and take their temperatures. The smooth-coated bull will read about 103. His friend will go to 106 or 107. Who wants to wear an overcoat on a hot day? You would take off your coat. Not all bulls can take off their coats.

You might ask, how can I buy a bull that will shed his coat? Most of you have watched the bull judging at the Brisbane Exhibition. Look at the first bulls to be sent out of the ring. What are their coats like? Many of them have left their overcoats behind. These are the bulls you want. You aren't aiming at winning a championship. You want a bull that is comfortable in your climate.

The ideal is to buy a bull that never has a woolly coat. These are rare. What is the next best? In North Queensland a woolly coat doesn't trouble a bull for about three months of the year. If he starts to shed his coat in August he will be cool in the summer months.

A bull starts to shed his coat when the length of the days increases. Some bulls can detect a smaller change in daylight hours than others. In the south there is a greater difference between the longest and the shortest day than in the north. Say a bull requires 1½ hours light increase to shed his coat. In Victoria this would happen in August or September. In our tropics this bull would be lucky to get his overcoat off for Christmas—a poor prospect for a southern visitor!

You may want to buy a good bull in southern Queensland or further south. Inspect him in the winter time. If his coat is smooth, then he will not be troubled by an overcoat in the tropical summers.

You may buy your bulls in Central or North Queensland. Inspect these in August. Select only the bulls that have started to shed their coats. Of course, you will consider other points, but a good conformation is no good if the bull cannot shed his coat.

A bull must be able to live and sire calves in your climate. The bull with a woolly coat may only survive.

You don't require skill to pick a smooth glossy coat. Why not look for this simple point?

MIXING HORMONE WEEDKILLERS.

Hormone weedkillers are not substitutes for energy, industry and good cultivation practices, but in the hands of an intelligent farmer they can be extremely useful for controlling weeds that would otherwise steal his profits.

Some farmers say they can't understand why recommendations for using hormone weedkillers are given in pounds of active ingredient per acre rather than as mixture of certain strengths.

Mr. S. L. Everist, Government Botanist, Department of Agriculture and Stock, explains that the effect of hormone weedkillers depends on the total weight of hormone applied per plant. The amount of liquid isn't particularly important, provided you use enough to spread the hormone evenly with the equipment available.

This is one reason why recommendations are given in pounds per acre. Other reasons are that different preparations vary in concentration and that some plants require greater amounts of hormone than others, or hormones of different types. Even more important is the fact that the various types of spray equipment do not deliver the same quantity of liquid per acre.

To destroy Noogoora burr, for example, you need 1 lb. of 2,4-D per acre. If you have an 80 per cent. powder, 10 lb. contains 8 lb. of active hormone and will, therefore, be enough for 8 acres. If you were using a knapsack spray, holding about 3 gall. and delivering about 100 gall. per acre, you would mix at the rate of 10 lb. of the powder to 800 gall. of water or about $\frac{3}{4}$ oz. in a knapsack full. For a boom spray delivering 20 gall. per acre, you would mix 10 lb. of the powder with 160 gall. of water. If you have a 50 per cent. liquid you know that 1 gall. (10 lb.) contains 5 lb. of active hormone, so for a knapsack spray you would mix at the rate of 1 gall. of the preparation to 500 gall. of water, that is, 1 fl. oz. to the knapsack. On the otther hand, if you were using a 20-gall.-per-acre boom spray, you would mix 1 gall. to 100 gall. of water.

Failure to compensate for smaller volumes by increasing the strength of the spray solution often gives poor results on difficult-to-kill weeds. If in any doubt about spray strength for particular weeds, or any other aspects of mixing weedkillers, consult your local Adviser in Agriculture.

A Combination Hay and Concentrate Feeder

By J. ARBUCKLE, Senior Adivser in Cattle Husbandry.

In recent years increasing attention has been given to the role of nutrition in the dairy and beef cattle industries of the State.

Where supplementary feeding is carried out, it is desirable to devise some system of feeding which combines the minimum amount of labour in distribution with the minimum wastage of feed.

The combination roughage and concentrate feeder described in this article has been found to be very satisfactory for group feeding weaner bulls on a property in Central Queensland—"Eulogie Park" Dululu.

Concrete Work.

The concrete work involved in the construction of the combination feeder comprises the trough, uprights to support the roof and brace the feeding rack, and an 8 ft. apron surrounding the trough.

The trough is made of a 2:2:1 mixture, made up to 4 inches thick on a rubble rock and sand foundation. A drainage hole is necessary at the end of each trough. Two pieces of 1½ in. steel piping inserted through the ends of the trough during the pouring of the concrete serve quite well. A smaller hole may clog easily with leaves and foodstuffs.

Plate 1.

Bull Weaners Feeding at the Combination Hay and Concentrate Feeder. Feed for a few days is stored in bags and bales above the feed trough, where it is protected from the weather.

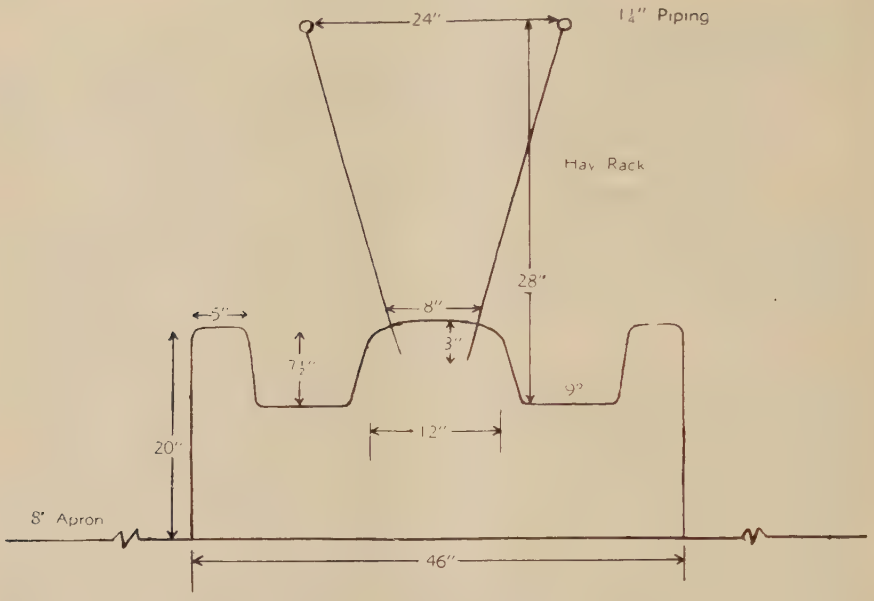

Plate 2.

Cut-out End View of Trough and Hay Rack.

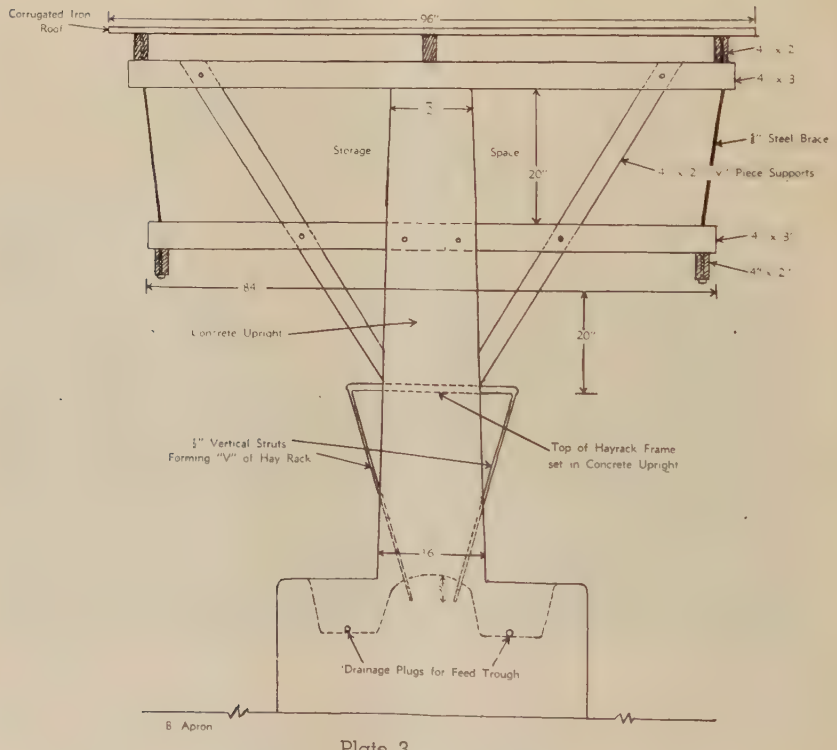

Plate 3.

End View of Trough, Hay Rack, Storage Space and Roof.

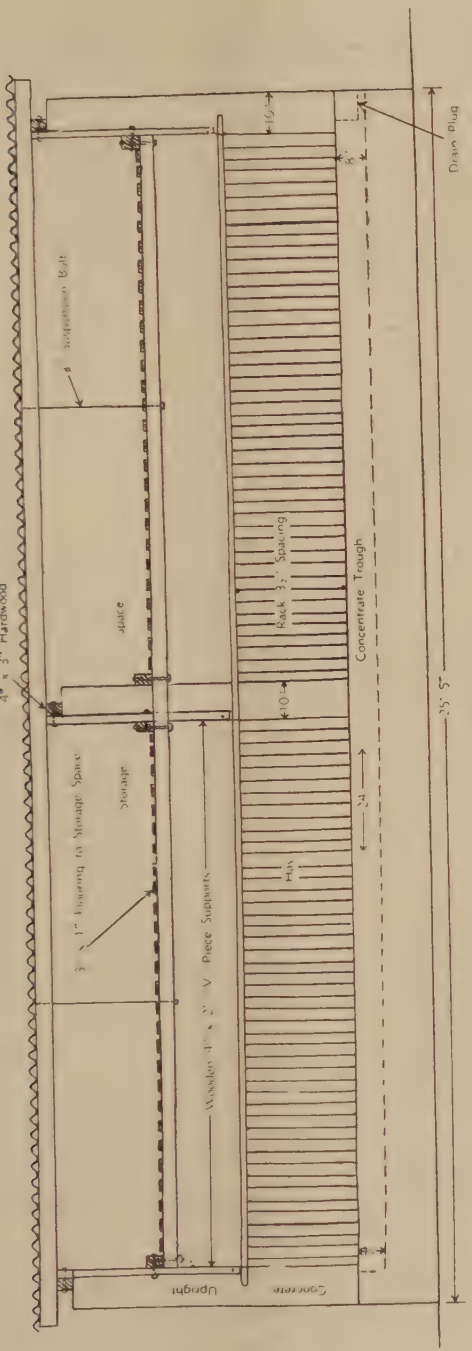

Plate 4.

Side View of Trough, Hay Rack and Storage Space of Two Bays. Note that the centre upright is used to support the hay rack, storage space flooring and roof in the same manner as the end uprights.

The number of concrete uprights necessary depends on the length of the trough. It is not advisable to have any bay longer than 12 feet. Each upright is 10 inches thick. It is built as one into the trough and extends 5 ft. 6 in. above the level of the trough. The uprights are reinforced with six lengths of $\frac{5}{8}$ in. steel.

The surrounding apron is of grouted stone on a sand foundation, using the largest rocks on the outside and the smaller ones towards the centre.

For building the trough, one bag of cement is required for each foot of troughing and two bags for each upright. One yard of sand and gravel mixture is needed for every five bags of cement.

Timber and Iron Work.

The hay rack is 8 inches wide at the base, 24 inches wide at the top, and 28 inches high. The struts are $3\frac{1}{2}$ inches apart and opposing struts are staggered to minimise the strain on the concrete base.

The hay rack is most easily made by first setting out a rectangular frame 24 ft. 7 in. long and 24 in. wide, which forms the top of the hay rack. Onto this, the vertical half-inch piping struts are sweated to form a V-shaped rack. This prefabricated rack is then set three inches into the base of the feed trough, with each end of the top rectangular frame set in the concrete upright.

The whole structure is covered with a corrugated iron roof.

With long spans, $\frac{5}{8}$ in. steel braces at the centre of each bay from the roof purloin to the joist in the floor of the storage space above the rack are essential.

The Designers.

The final design of the feeder illustrated and described here was by Messrs. D. McCamley ("Playfields"), E. W. G. McCamley ("Eulogie Park") and S. Kele (Rockhampton).

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Heart-leaf Poisoning of Cattle

By D. F. MAHONEY, Divisional Veterinary Officer.

The heart-leaf poison bush or desert poison (*Gastrolobium grandiflorum*) has a wide distribution in northern and central Queensland. It grows on poor forest country in the vicinity of the Great Dividing Range and is found as far north as Mount Garnet and as far south as Yalleroi and Jundah.

Heart-leaf is poisonous to cattle but as it grows on poor country, which is lightly grazed if at all, it does not cause many deaths in normal seasons —just an odd one at mustering. However, in dry years, when cattle are forced to search for food over a wide area, or after an extensive burn when the fresh shoots appear, you can be prepared for heavier losses. Running recently bought cattle where they have access to heart-leaf country is also risky. Some have had mortalities as high as 10 per cent. in these circumstances.

Toxicity for Cattle.

Feeding trials with cattle have shown that heart-leaf is toxic either green or dry and that mature leaves and stems are as poisonous as fresh young shoots. The seedlings, however, are generally considered to be non-toxic until they are about six inches high.

In one feeding experiment a steer died within 24 hours after eating one pound of mature green leaves and flowers. In another experiment half a pound of dried shoots caused the death of a steer less than 24 hours after administration. In both trials, the animals were given exercise after the plant was fed.

Symptoms.

Driving seems to bring on symptoms of heart-leaf poisoning, and you often see them when mustering off heart-leaf country. Affected animals lag behind the rest of the mob and get away on their own. Recovery is rare in such cases and the animals are usually dead by the time you return to see how they are. You will notice stiffening of the limbs, muscle trembling and staggering in the later stages before the animals go down. Death occurs soon afterwards.

Post-mortem Appearance.

If you open up an animal which has just died from heart-leaf poisoning you can expect to see any of the following changes.

(*a*) Small haemorrhages beneath the skin in the flank and shoulder regions.

(*b*) Congested liver and kidneys and small haemorrhages on the surface of the kidneys.

(*c*) The lining of the small intestine and of the fourth stomach inflamed. The lining of the paunch lifts easily and small haemorrhages are present underneath it.

(*d*) Patches of haemorrhages on the surface of the heart and the lower parts of both lungs congested.

Control.

You can control heart-leaf poisoning by fencing off the country where the plant grows. This is usually possible because of the poor nature of such country.

In some areas the shrub has been eradicated by grubbing, making sure to cut the stem below the tuber and then burning the cut material. It will not sucker if treated this way. The seedlings which come up after grubbing can be destroyed by heavy stocking. The value of the infested area will determine your choice.

Treatment.

No attempts at treating affected cattle have ever been recorded in Queensland. In Western Australia, sheep affected with heart-leaf poisoning have been drenched with Condy's crystals with favourable results. One-eighth of an ounce of this drug would be sufficient for a cow.

DON'T MAKE HARD WORK OF DRENCHING SHEEP.

Most woolgrowers don't like drenching sheep. Though it's a routine job, it can often be hard and tiring work.

However, Mr. N. Jackson, Senior Adviser, Sheep and Wool Branch, Department of Agriculture and Stock, points out that with a little planning and thought you can make the job comparatively easy.

You often encounter the first difficulty in the drenching race itself. Usually the race is far too wide and the sheep still to be drenched dodge past you. The race should not be more than three or four sheep wide. If it is this width and you work in the race, it is a simple matter to control the sheep with your free hand and your knees.

Commence drenching at the top end of the race (the exit) and work back through the sheep to the race entrance. If you do this, most sheep will be facing the exit and ready to leave when you have completed the raceful and open the gate.

For drenching you may use either a drenching funnel or an automatic gun. If you use a funnel, run a wire about shoulder high along one side of the race. From this you can suspend a container of the drench you are using and move it along with you as you work through the race. This is a real time-saver.

Experience has shown that this is the easiest way to drench a sheep: Place your free hand over the sheep's muzzle and part its lips with the fingers and thumb. At the same time raise the sheep's head so that the nose and eyes are on the same horizontal plane. Insert the mouthpiece of the funnel or automatic gun into the sheep's mouth between the cheek and the lower jaw. Then release the liquid gently into the animal's mouth.

Take care that you don't press the mouthpiece against the sheep's tongue or into the back of its throat, as this will make it difficult for the animal to swallow. If the sheep is reluctant to swallow, move the tongue with your fingers. This will usually make it gulp down the drenching fluid. Don't drench a sheep when it isn't standing naturally or when it is struggling; it is better to let it go and catch it a second time.

Making Bloodtesting Easy

By B. W. MOFFATT (Assistant Adviser) and A. R. PRICE (Poultry Inspector), Poultry Branch.

Bloodtesting of fowls for pullorum disease is a job which has to be done every year. Most farmers do not look forward to the few days they have to spend catching and holding birds to be tested, as it is tiring work. Because of this, some farmers have given thought to ways and means of making the work easier.

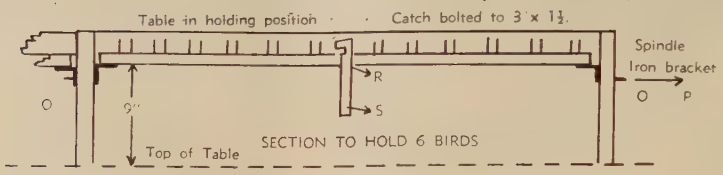
As officers who carry out this work, we realise how tedious it is for the farmer and we would like to bring before the notice of other farmers who bloodtest the benefit to be derived from the use of the table illustrated here. To Mr. W. Warren, of Tingalpa, who designed the original table, and Mr. E. Norbury, of Wynnum West, who has modified it, we give due acknowledgement.

The Table.

The table itself is made of light pine, is easily carried by two persons and will pass through standard doorways. It eliminates the holding of the birds on the table by one of the operators, as the birds' legs are held between two dowels on the back of the table. The six birds, when tested, can then be released together by simply pulling a lever. This allows the frame holding the legs to fall forward, releasing the birds under the table.

As the table will hold 12 birds, the officer doing the bloodtest has six birds ready to test while the other side of the table is being filled with birds to be tested. Two persons, one catching

Plate 1.
View of Bloodtesting Table



DETAIL OF HOLDING BIRDS

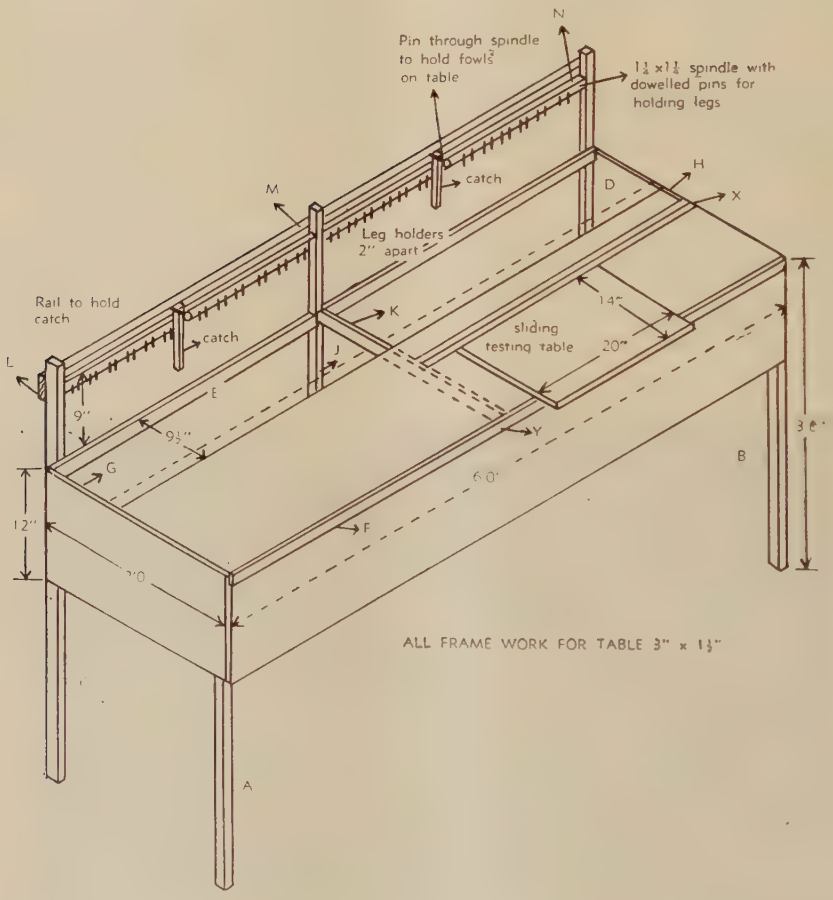


Plate 2.

Plan of Bloodtesting Table.

birds and one filling the table, should be able to keep at least six birds ahead of the testing officer.

How to Build the Table.

The timber required and the position of the various pieces of timber (see Plate 2) are as follows:

Legs:

Two 3 ft. lengths 3 x 1½ pine (A and B).

Two 4 ft. lengths 3 x 1½ pine (C and D).

Intermediate Stud:

One 2 ft. length 3 x 1½ (J).

Rails:

Three 6 ft. lengths 3 x 1½ (E, F, and L).

Three 2 ft. lengths 3 x 1½ (G, K, and H).

Top:

Four 6 ft. lengths 4 x ⅝.

Sides (front and back):

Six 6 ft. lengths 4 x ⅝.

Ends:

Six 2 ft. lengths 4 x ⅝.

Table and Fttings:

One 3 ft. length rabbetted timber (X).

One 3 ft. length grooved timber (Y).

Firstly the two front legs (A and B) are cut to measure (3 ft.) and the two back legs to 4 ft. The side rails (E and F) of the table are 5 ft. 10½ in. and housed into the legs.

The end rails (G and H) are 1 ft. 9 in. and also housed into the legs. An intermediate rail (K) is cut in between E and F to support the top of the table. The table top and sides, consisting of 4 x ⅝ timber, are now nailed to the framework.

An intermediate stud (J) is fixed at the centre of the back rail and held in position by a rail (L) fixed to the outside of the top of the back legs. Two pieces of 1¼ x 1¼ timber (M and N) are now cut 2 ft. 9½ in. long and 4 in. nails or dowels are fixed into them.

A small angle bracket (O) is now fixed to these rails as shown in Plate 2. Pins (P and Q) are then fixed to the back studs and angle brackets, thus allowing the spindle to revolve. A pin (R) extending through the centre of each of these spindles is held in position by a catch (S) fixed to the back outside rail.

The sliding table for testing is 20 in. long by 14 in. wide. It is held in position by a 3 ft. length of rabbetted timber (X) fixed to the table top and a grooved piece (Y) 3 ft. long fixed to the front of the table as shown. A fillet is fixed on the tester's table to fill the groove in the timber on the table front, thus allowing the tester's table to slide.

The Table in Operation.

For ease of working, the table is best used in conjunction with catching frames which are sufficiently large to hold all the birds to be tested in that pen. The table is then placed close to one side of the frames so that the birds do not have to be carried any distance. The person supplying the table with birds then places each bird separately on the table, with its legs held by the dowels at the back of the table. Six birds are thus held on each side of the table.

As the tester takes the blood from each bird, he pushes the body of the bird back so that it hangs in the gap between the table top and the back of the table. When the six birds have been bled and the slides read, the operator pulls the lever releasing the birds. The spindle carrying the

Plate 3.

Table in Operation, with Six Birds Tested and Ready to be Released.

Plate 4.

Table Being Filled with Birds from Catching Frame.

dowels for holding the birds' legs is so constructed that when the catch is released the weight of the birds drags the spindle forward and the legs fall out of the dowels, thus releasing the birds.

The testing officer works on the small sliding table attached to the top of the bloodtesting table, which can be moved to any position to suit the officer.

As the dowels are made for holding hens' legs, cockerel legs do not fit very well. However, the table can be used for cockerels if the birds are lifted off the table when tested rather than released together by pulling the lever.

TIMBER MEASUREMENTS.

The super foot measurement is calculated by multiplying the width in inches by the thickness in inches by the length in feet, and dividing the result by 12.

For example, 100 lineal feet of 12 × 1½ timber equals 150 super feet, the calculation being

$$\frac{12 \times 1\frac{1}{2} \times 100}{12} = 150$$

The Cream Separator as Used on Dairy Farms in Queensland

By J. D. ELRINGTON, Senior Adviser (Machinery), Division of Dairying.

(*Continued from page 295 of the May issue.*)

V. INSTALLATION OF THE SEPARATOR.

The separator should be installed in such a way that it is *firm* and *level.* It should be in such a position that the drive will be smooth and free from all irregularities and the belts in belt-driven machines will not slip.

The base of the separator must be mounted on a suitable foundation so that the machine can be operated without any vibration. The foundation is usually a reinforced concrete block of suitable height and size let into the ground one to three feet, depending on the soil type. The separator should be bolted firmly on to this block, the heads of the bolts being set in place when the concrete is poured.

The separator should not be mounted on a block which is built onto a concrete floor, neither should a wooden block or stump be used. It takes time and patience to level the separator perfectly, and if the block moves due to movement of the floor or foundations, the separator may be operated for a long period without being level, thereby wearing the bearings unnecessarily. The operator may periodically have to spend a good deal of time correcting a fault which would never have developed if the separator was correctly installed originally.

The position of the separator plays a major part in obtaining an effective and trouble-free drive during the life of the machine.

Hand-driven machines should be in such a position that there is complete freedom of movement for the operator, and the handle should be at a comfortable height.

Where the separator is driven by the milking machine engine or an electric motor through belts and countershafting, there are three things to be considered in getting a suitable drive. These are (*a*) distance between shafts, (*b*) size of pulleys, and (*c*) width and type of belt.

(*a*) *Distance between Shafts.*—The best distance between the shafts depends on the size and weight of the shafts, belts and pulleys. As a separator drive requires only light equipment, the distance between shafts need not be very great. However, if the shafts are too close, the belt will have to be so tight that the shafting may be pulled out of line.

(*b*) *Size of Pulleys.*—The belt drive depends for its efficiency not only on its length and speed of travel, but also on its arc of contact with the pulleys. If there is a considerable difference in size between the pulleys, then the belt does not get a very good grip on the smaller pulley. It was noticed on some farms that an 8-in. pulley travelling at approximately 300 r.p.m. was driving a 2-in. pulley with a tight flat belt. The arc of contact on the 2-in. pulley was so small that the belt slipped when the separator was working, resulting in very irregular tests and considerable loss of butterfat.

It is customary to set the countershaft approximately 6 ft. from the engine and arrange the pulleys so that the countershaft revolves between 300 and 400 r.p.m., depending on the engine speed. The drive from the countershaft to the conventional clutch on the separator is then easily arranged and the separator can be mounted 4-8 ft. from the shaft.

(*c*) *Width and Type of Belt.*—There are two types of belt in use in this State, the leather belt and the rubber-impregnated canvas belt. Usually a belt 1 in. wide is used to drive the separator, as the power required is very small. The leather belt is considered the better because, once stretched, atmospheric conditions have very little effect on it.

The belt should be joined with the correct size clip or lace and should be kept pliable with judicious applications of a good quality belt dressing. It should be installed so that, when operating, the lower half is tight and the upper half has a free vertical movement of one to three inches in the centre of the span. A slack belt will drive the bowl unevenly and a tight one will place undue strain on the separator and shaft bearings.

Speeds are proportional to pulley diameters. The formula for finding the correct pulley size on the countershaft is—

$$\text{Countershaft pulley diameter in inches} = \frac{\text{Separator pulley diameter (in.)} \times \text{Separator pulley speed (r.p.m.)}}{\text{Countershaft pulley speed (r.p.m.)}}$$

For example, with a separator pulley diameter of 6 in. a separator pulley speed of 628 r.p.m., and a countershaft pulley speed of 300 r.p.m.,

$$\text{Countershaft pulley diameter} = \frac{6 \times 628}{300} = 12.5 \text{ in.}$$

A 12 in. pulley will do, because this will give a speed of 600 r.p.m. at the separator, which is well within the range stated by the maker (593-628 r.p.m.).

It is bad practice to drive the separator from a countershaft coupled direct to an engine or a vacuum pump. This drive causes the separator to run unevenly, causing damage to the separator bearings and bowl. The power must be transmitted either direct from the

engine or motor to the countershaft, or via V belts between the vacuum pump and the countershaft, and thence to the separator (Plates 3 and 4). A skim-milk pump driven off the same countershaft as the separator can also damage it by imparting an irregularity to the separator drive.

Erect safety guards over and around all belts, shafting and pulleys.

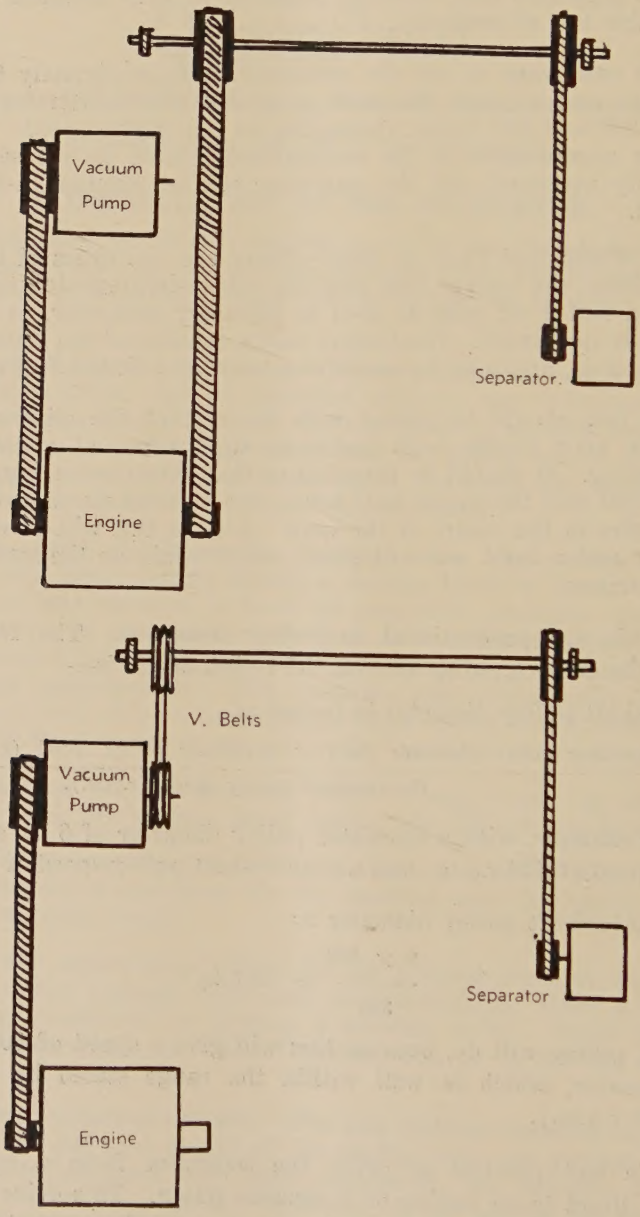


Plate 3.

Suitable Ways of Driving the Separator.

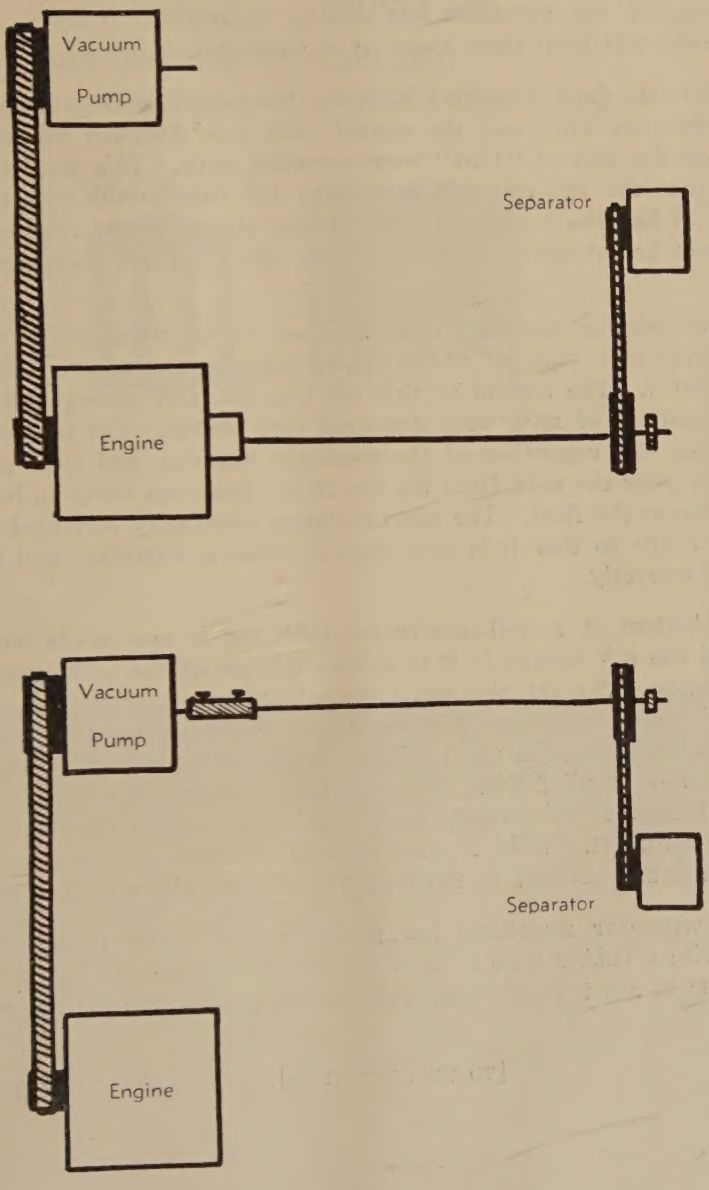


Plate 4.

Unsuitable Ways of Driving a Cream Separator.

VI. MILK SUPPLY TO THE SEPARATOR.

The supply of milk to the separator bowl is a very important phase of cream separation, incorrect "feed" being responsible for a large proportion of the butterfat lost during separation. Correct initial installation will keep these losses at a minimum.

Before the days of milking machines, the separator and supply tank (vat) were one unit, and the supply tank was designed so that the conditions for correct "feed" were complied with. This tank was so shaped that the tap ran full bore until the supply-tank was almost emptied, it had the correct size tap for the separator and the tap was the correct height above the float. These are the three main requirements.

When milking machines came into use it was necessary to use a large supply tank (vat) of 50-100 gallons capacity to feed the milk into the separator. The bottom of this vat was flat, and consequently the last few gallons of milk were delivered very slowly. The tap was of 120 gallons size regardless of the separator capacity and the "goose-neck" carrying the milk from the tap to the float was likely to be any distance from the float. The manufacturers eventually corrected most of these faults so that it is now easy to instal a separator and large milk vat correctly.

The bottom of a well-constructed milk vat is now made with a slope and has a V trough in it to deliver the last of the milk evenly to the separator. The vat also has a strengthening rim around its edge. The tap is set in this rim to prevent it from moving even if the bottom of the vat has a bulge in it. The ideal installation is to use the supply tank and tap supplied with the separator, mounting the separator so that the bottom of this supply tank is $\frac{1}{2}$ in. lower than the bottom of the large milk vat. Weld a piece of metal tubing into the separator supply tank and connect to the milk vat with a rubber tube.

The separator sometimes has a safety feed device connected to the tap with a rubber tube to keep the float at the correct height and, in the case of one type of safety feed, to compensate for the large vat tap.

[TO BE CONTINUED].

CHANGE OF VOLUME.

Librarians and other interested persons are informed that as from 1956 the 12 issues for the year will constitute one volume, not two as in the past.